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A

GRAMMAR SCHOOL

ARITHMETIC

BY

G. A. WENTWORTH, A.M.,

AUTHOR OF A SERIES OF TEXT-BOOKS IN MATHEMATICS.

TEACHERS' EDITION.

BOSTON, U.S.A.:
GINN & COMPANY, PUBLISHERS.
1894.

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PREFACE.

THIS edition is intended for teachers, and for them only. The publishers will make every effort to keep the book from pupils; and teachers are urged to exercise the utmost care not to lose their copies, or to leave them where pupils can have access to them.

It is hoped that young teachers will derive great advantage from studying the systematic arrangement of the arithmetical work, for such attention has been paid to this as the limitation of the page would allow.

It is also expected that many teachers, who are pressed for time, will find great relief by not being obliged to work out every problem in the Arithmetic.

G. A. WENTWORTH.

EXETER, N.H.,
May, 1889.

KEY

TO

GRAMMAR SCHOOL ARITHMETIC.

Ex. 1. Page 7.

1. 236, 140, 502, 703.
2. 514, 376, 430, 802, 927.
3. 190, 406, 810, 207.
4. 310, 213, 623, 219.
5. 550, 404, 425, 860.
6. 816, 708, 900, 703.
7. 995, 880, 700, 807.
8. 217, 412, 408, 102.
9. 417, 619, 306, 118.

Ex. 2. Page 8.

1. Five hundred, seven hundred, three hundred, two hundred, nine hundred, one hundred.

2. Eight hundred thirty, seven hundred nine, five hundred six, three hundred fifty, eight hundred nineteen, seven hundred three.

3. Six hundred seven, three hundred twelve, nine hundred eighteen, eight hundred ten, one hundred three, five hundred sixty.

4. Seven hundred fifty-two, six hundred ninety-eight, four hundred five, five hundred thirty-six, one hundred twenty-one, five hundred fourteen.

5. Nine hundred seventy-three, three hundred fifty-six, seven hundred three, four hundred nine, two hundred eleven, seven hundred thirteen.

6. Two hundred twenty-five, sixty-four, nine hundred seventy, forty-nine, eighty-three, six hundred seventy-four.

7. One hundred six, one hundred seventy, three hundred eighty seven hundred fifty-nine, nine hundred twenty-one, five hundred thirty-eight.

8. Four hundred eighty-one, three hundred sixty, five hundred ninety-three, thirty-two, two hundred ninety-six, five hundred fifty-one.

9. One hundred eighty-two, eight hundred two, five hundred fifty-five, seven hundred five, six hundred forty-nine, six hundred thirty.

10. Three hundred fourteen, ninety-seven, six hundred thirteen, three hundred eighty-four, nine hundred ninety-two, five hundred sixteen.

Ex. 3. Page 8.

1. 8703, 4045, 6308, 4800.
2. 5048, 1990, 7082, 8050.
3. 7240, 9919, 6007, 8776.
4. 7107, 6804, 9110, 5550.
5. 6086, 4040, 1010, 9099.
6. 8080, 1757, 1101, 7007, 4545.
7. 2496, 1883, 3095, 1011.
8. 1013, 1001, 1400, 33,014.
9. 1736, 3049, 8018, 9070.
10. 4709, 1510, 1069, 16,016.

Ex. 4. Page 9.

1. Eight thousand, five thousand, two thousand, six thousand, one thousand, nine thousand.

2. Nine thousand two hundred ten, six thousand nine hundred seven, seven thousand four hundred two, nine thousand nine hundred ninety-eight, four thousand sixty, seven thousand two hundred ten.

3. Five thousand sixty-eight, four thousand twenty, fourteen hundred, seven thousand thirty-one, twelve hundred ninety, one thousand ten.

4. Eight thousand eight hundred eight, six thousand six, eight thousand four hundred eighty-two, three thousand ninety-six, four thousand seven hundred twenty, eleven thousand nine hundred seventy-three.

5. Twelve thousand two, eleven thousand one hundred one, five thousand eight hundred twelve, seventeen hundred thirty-nine, six thousand seven hundred sixty, six thousand nine hundred three.

6. Four thousand eighty-five, eleven hundred sixty-nine, twenty-six hundred fifteen, five thousand seven, eleven hundred ten, fourteen hundred sixty.

7. Four thousand seven hundred sixty, four thousand one hundred ninety, twenty-six hundred seven, five thousand one hundred eighty, twelve hundred, three thousand seven hundred forty-six.

8. Nine thousand eight, eight thousand three hundred, six thousand eight hundred four, two thousand nine hundred seventy-seven, six thousand two hundred two, nine thousand six hundred twenty.

9. Six thousand three hundred twenty-two, seven thousand four hundred fifty, eight thousand six hundred seventy-three, twenty-six hundred three, twenty-five hundred eighteen, fifteen hundred eight.

10. Seven thousand eighty, one thousand nine, eight thousand seventy, five thousand sixty-eight, thirteen hundred ninety-seven, five thousand seven hundred eighty-two.

Ex. 5. Page 9.

1. 12.12, 22.8, 325.6, 101.101.
2. 75.75, 83.026, 96.704, 1010.2.
3. 573.573, 11004.16, 365.8, 72.96.
4. 3.019, 658.02, 800.08, 37.005.
5. 71.7, 7.17, 700.017, 810.1.
6. 81.01, 8.101, 963.2, 96.32, 9.632.
7. 600.5, 60.05, 6.005.
8. 983.3, 98.33, 9.833.
9. 112.1, 11.21, 1.121.
10. 11,000.063, 23.86, 110.11.

Ex. 6. Page 10.

1. Three thousand ten and three-tenths, four hundred seventy-seven and twelve hundredths, sixty and two hundred six thousandths, six hundred ninety-eight and ninety-seven hundredths, seven hundred seventy-eight and fifteen hundredths, eighty-four and five hundred ten thousandths.

2. Nine hundred three and nine-tenths, four hundred thirteen and nine-tenths, seventeen and nine hundred eighteen thousandths, one hundred thirteen and ninety-four hundredths, fourteen and six hundred thirteen thousandths, two hundred four and twelve hundredths.

3. Two hundred thirty-four and five-tenths, three thousand ten and three-tenths, fifty-nine and one hundred six thousandths, forty-three and one hundred thirty-six thousandths, three hundred eighty and twenty-one hundredths, three hundred sixty-one and seventy-three hundredths.

4. Six thousand one hundred eighty-seven and eight-tenths, seven hundred eighty-five and thirty-three hundredths, ninety and eight hundred forty-nine thousandths, ninety-two and two hundred ninety-four thousandths, twenty-seven and nine hundred eighty-nine thousandths, twenty-eight and twelve thousandths.

5. Two hundred ninety-one and fifty-nine hundredths, twenty-nine and six hundred forty-five thousandths, thirty and eighty-one thousandths, two hundred ninety-nine and seven hundredths, thirty and one hundred ninety thousandths, thirty-five and two hundred fifty-seven thousandths.

6. Three hundred sixty and four-tenths, three thousand six hundred five and nine-tenths, three hundred sixty-one and sixteen hundredths, thirty-nine and forty-one thousandths, four hundred sixty-eight and sixty-four hundredths, four hundred sixty-three and fifty-nine hundredths.

7. Forty-seven and eight hundred twenty-eight thousandths, fifty-nine and one hundred eighty-four thousandths, six hundred and sixty-five hundredths, six hundred one and nineteen hundredths, sixty and one hundred eight thousandths, fifty-two and four hundred sixty-six thousandths.

8. Five hundred ten and fourteen hundredths, fifty-one and twenty-eight thousandths, five hundred eighty and thirty-five hundredths, five thousand eight hundred four and seven-tenths, six hundred forty-one and ninety-seven hundredths, six thousand four hundred nine and eight-tenths.

9. Sixty-five and two thousandths, sixty-nine and nine hundred forty-nine thousandths, six hundred two and seventeen hundredths, six thousand twenty and six-tenths, sixty-four and fifty-eight thousandths, seventy-six and three hundred forty-three thousandths.

10. Seven hundred seventy and eighty-five hundredths, six thousand nine hundred ninety-four and nine-tenths, seven hundred twelve and six hundredths, seven hundred nineteen and sixty-six hundredths, eight hundred thirty-three and eighty-seven hundredths, eighty-three and four hundred ninety-three thousandths.

Ex. 7. Page 11.

1. $50,003, $80,990.
2. $28,744,169.
3. $516.10, $2550.69.
4. $1,600,030,308.50.
5. $2,700,001,001.87.
6. $500,201.75.
7. $8,014,325.25.
8. $97,200,102.05.
9. $10,010,010.10.
10. $1,110,000.11.

Ex. 8. Page 11.

1. Two hundred fifty-nine thousand one hundred thirty-two dollars and ten cents; twenty-seven thousand one hundred eighty-six dollars and twenty-five cents.

2. One million two hundred thirteen thousand sixty-two dollars and fifty cents; two million seven hundred sixty-three thousand one dollars and seventy-five cents.

3. Three million six hundred seventy-five thousand three hundred twenty-one dollars and twelve cents; three million five hundred thousand five dollars and fifteen cents.

4. Seventeen million three hundred sixty thousand five hundred two dollars and twenty cents; twenty-seven million one hundred thirty-two thousand eight hundred fifty-seven dollars and thirty-three cents.

5. Fifty-five million three hundred thirty-three thousand two hundred sixty-three dollars and thirty-six cents; fifty-eight million seven hundred eighty-five thousand five hundred eighty-seven dollars and nine cents.

6. One hundred sixteen million one thousand five hundred fifty-six dollars and forty cents; two hundred seventy-five million three hundred sixty-three thousand seven hundred fifty dollars and eleven cents.

7. Six hundred sixty million eight hundred seventy-eight thousand six hundred forty dollars and sixty-nine cents; five hundred ninety-four million three hundred forty thousand dollars and ninety-four cents.

8. Six hundred million two hundred forty-one thousand five hundred sixty dollars and two cents; one hundred twenty-four million two hundred seventy-one thousand dollars and one cent.

9. Seven hundred sixty-eight million three hundred one thousand five hundred twenty dollars and twenty cents; eight hundred two million six hundred thirty-one thousand five hundred sixteen dollars and seventy-three cents.

10. Five hundred five million six hundred thirty-one thousand eight hundred eighty dollars and four cents; fifteen hundred and fifty-five million six hundred seventy-six thousand four hundred ten dollars and sixty-two cents.

Ex. 9. (*Oral.*) Page 12.

1 + 1 = 2
2 + 1 = 3
2 + 2 = 4
2 + 5 = 7
3 + 4 = 7
8 + 3 = 11
0 + 4 = 4
8 + 4 = 12
5 + 5 = 10
2 + 5 = 7
6 + 3 = 9
6 + 6 = 12
5 + 7 = 12
8 + 7 = 15
8 + 1 = 9
8 + 3 = 11
9 + 0 = 9
4 + 9 = 13

3 + 1 = 4
8 + 1 = 9
2 + 0 = 2
6 + 2 = 8
2 + 3 = 5
3 + 0 = 3
5 + 4 = 9
4 + 3 = 7
5 + 7 = 12
5 + 1 = 6
1 + 6 = 7
4 + 6 = 10
5 + 6 = 11
7 + 2 = 9
5 + 8 = 13
8 + 8 = 16
9 + 9 = 18
9 + 6 = 15

1 + 0 = 1
1 + 4 = 5
1 + 2 = 3
3 + 2 = 5
5 + 3 = 8
3 + 6 = 9
4 + 7 = 11
2 + 4 = 6
3 + 5 = 8
4 + 5 = 9
5 + 6 = 11
6 + 9 = 15
7 + 3 = 10
4 + 7 = 11
2 + 8 = 10
4 + 8 = 12
9 + 2 = 11
8 + 9 = 17

1 + 7 = 8
6 + 1 = 7
8 + 2 = 10
2 + 4 = 6
1 + 3 = 4
3 + 3 = 6
9 + 4 = 13
4 + 4 = 8
0 + 5 = 5
5 + 6 = 11
6 + 0 = 6
7 + 6 = 13
7 + 1 = 8
7 + 7 = 14
8 + 0 = 8
8 + 6 = 14
1 + 9 = 10
9 + 5 = 14

1 + 5 = 6
9 + 1 = 10
2 + 7 = 9
2 + 9 = 11
3 + 7 = 10
9 + 3 = 12
4 + 1 = 5
4 + 6 = 10
5 + 9 = 14
8 + 5 = 13
2 + 6 = 8
6 + 8 = 14
0 + 7 = 7
7 + 9 = 16
7 + 8 = 15
9 + 8 = 17
3 + 9 = 12
7 + 9 = 16

5	6	8	7	4	3	6	6	6	7
3	7	3	5	5	6	4	8	5	5
8	13	11	12	9	9	10	14	11	12

7	7	7	7	7	8	5	8	8	8
7	2	9	4	8	2	8	7	9	8
14	9	16	11	15	10	13	15	17	16

9	9	9	9	6	2	3	8	3	6
1	4	7	8	8	5	4	2	6	5
10	13	16	17	14	7	7	10	9	11

8	7	5	3	7	8	9	5	4	3
7	2	4	8	3	3	3	3	3	3
15	9	9	11	10	11	12	8	7	6

Ex. 10. Page 14.

Find the sums of the following numbers:

1. 28
5
—
33

2. 43
6
—
49

3. 54
7
—
61

4. 63
8
—
71

5. 74
3
—
77

6. 18
9
—
27

7. 85
7
—
92

8. 19
8
—
27

9. 29
7
—
36

10. 56
8
—
64

11. 78
5
—
83

12. 78
9
—
87

13. 32
7
—
39

14. 27
9
—
36

15. 37
5
—
42

16. 37
9
—
46

17. 32
9
—
41

18. 58
9
—
67

19. 79
4
—
83

20. 57
8
—
65

21. 63
8
—
71

22. 36
8
—
44

23. 59
4
—
63

24. 93
9
—
102

25. 47
8
—
55

26. 65
9
—
74

27. 27
8
—
35

28. 27
6
—
33

29. 42
9
—
51

30. 12
9
—
21

31. 50
5
—
55

32. 89
7
—
96

33. 49
5
—
54

34. 67
9
—
76

35. 43
7
—
50

36. 35
9
—
44

37. 14
6
—
20

38. 73
8
—
81

39. 13
9
—
22

40. 79
6
—
85

42 + 9 = 51
71 + 9 = 80
85 + 8 = 93
29 + 6 = 35

19 + 8 = 27
26 + 7 = 33
18 + 7 = 25
38 + 5 = 43

17 + 9 = 26
35 + 8 = 43
17 + 3 = 20
15 + 7 = 22

23 + 8 = 31
47 + 6 = 53
18 + 9 = 27
14 + 8 = 22

Ex. 11. Page 15.

Add:

1. $\begin{array}{r} 497 \\ \underline{735} \\ 1232 \end{array}$

2. $\begin{array}{r} 840 \\ \underline{869} \\ 1709 \end{array}$

3. $\begin{array}{r} 997 \\ \underline{289} \\ 1286 \end{array}$

4. $\begin{array}{r} 643 \\ \underline{937} \\ 1580 \end{array}$

5. $\begin{array}{r} 958 \\ \underline{294} \\ 1252 \end{array}$

6. $\begin{array}{r} 689 \\ \underline{297} \\ 986 \end{array}$

7. $\begin{array}{r} 477 \\ \underline{335} \\ 812 \end{array}$

8. $\begin{array}{r} 449 \\ \underline{483} \\ 932 \end{array}$

9. $\begin{array}{r} 857 \\ \underline{816} \\ 1673 \end{array}$

10. $\begin{array}{r} 842 \\ \underline{863} \\ 1705 \end{array}$

11. $\begin{array}{r} 9535 \\ \underline{9675} \\ 19210 \end{array}$

12. $\begin{array}{r} 5557 \\ \underline{5763} \\ 11320 \end{array}$

13. $\begin{array}{r} 8284 \\ \underline{7998} \\ 16282 \end{array}$

14. $\begin{array}{r} 8956 \\ \underline{7694} \\ 16650 \end{array}$

15. $\begin{array}{r} 3448 \\ \underline{4876} \\ 8324 \end{array}$

16. $\begin{array}{r} 56902 \\ \underline{94876} \\ 151778 \end{array}$

17. $\begin{array}{r} 93689 \\ \underline{60086} \\ 153775 \end{array}$

18. $\begin{array}{r} 59857 \\ \underline{84556} \\ 144413 \end{array}$

19. $\begin{array}{r} 83897 \\ \underline{50799} \\ 134696 \end{array}$

20. $\begin{array}{r} 59988 \\ \underline{99939} \\ 159927 \end{array}$

Ex. 12. (*Oral.*) Page 16.

Add by twos to 50, beginning 0, 2, 4, 6, 8. Add by twos to 51, beginning 1, 3, 5, 7, 9.

0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50.

1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51.

Add by threes to 102, beginning 0, 3, 6. Add by threes to 100, beginning 1, 4, 7. Add by threes to 101, beginning 2, 5, 8.

0, 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 63, 66, 69, 72, 75, 78, 81, 84, 87, 90, 93, 96, 99, 102.

1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100.

2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53, 56, 59, 62, 65, 68, 71, 74, 77, 80, 83, 86, 89, 92, 95, 98, 101.

Add by fours to 100, beginning 0, 4, 8. Add by fours to 101, beginning 1, 5, 9. Add by fours to 102, beginning 2, 6, 10. Add by fours to 103, beginning 3, 7, 11.

0, 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 76, 80, 84, 88, 92, 96, 100.

1, 5, 9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 57, 61, 65, 69, 73, 77, 81, 85, 89, 93, 97, 101.

2, 6, 10, 14, 18, 22, 26, 30, 34, 38, 42, 46, 50, 54, 58, 62, 66, 70, 74, 78, 82, 86, 90, 94, 98, 102.

3, 7, 11, 15, 19, 23, 27, 31, 35, 39, 43, 47, 51, 55, 59, 63, 67, 71, 75, 79, 83, 87, 91, 95, 99, 103.

Add by fives to 100, beginning 0, 5, 10. Add by fives to 101, beginning 1, 6, 11. Add by fives to 102, beginning 2, 7, 12. Add by fives to 103, beginning 3, 8, 13. Add by fives to 104, beginning 4, 9, 14.

5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100.

1, 6, 11, 16, 21, 26, 31, 36, 41, 46, 51, 56, 61, 66, 71, 76, 81, 86, 91, 96, 101.

2, 7, 12, 17, 22, 27, 32, 37, 42, 47, 52, 57, 62, 67, 72, 77, 82, 87, 92, 97, 102.

3, 8, 13, 18, 23, 28, 33, 38, 43, 48, 53, 58, 63, 68, 73, 78, 83, 88, 93, 98, 103.

4, 9, 14, 19, 24, 29, 34, 39, 44, 49, 54, 59, 64, 69, 74, 79, 84, 89, 94, 99, 104.

Add by sixes to 102, beginning 0, 6, 12. Add by sixes to 103, beginning 1, 7, 13. Add by sixes to 104, beginning 2, 8, 14. Add by sixes to 105, beginning 3, 9, 15. Add by sixes to 100, beginning 4, 10, 16. Add by sixes to 101, beginning 5, 11, 17.

0, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72, 78, 84, 90, 96, 102.

1, 7, 13, 19, 25, 31, 37, 43, 49, 55, 61, 67, 73, 79, 85, 91, 97, 103.

2, 8, 14, 20, 26, 32, 38, 44, 50, 56, 62, 68, 74, 80, 86, 92, 98, 104.
3, 9, 15, 21, 27, 33, 39, 45, 51, 57, 63, 69, 75, 81, 87, 93, 99, 105.
4, 10, 16, 22, 28, 34, 40, 46, 52, 58, 64, 70, 76, 82, 88, 94, 100.
5, 11, 17, 23, 29, 35, 41, 47, 53, 59, 65, 71, 77, 83, 89, 95, 101.

Add by sevens to 105, beginning 0, 7, 14. Add by sevens to 106, beginning 1, 8, 15. Add by sevens to 100, beginning 2, 9, 16. Add by sevens to 101, beginning 3, 10, 17. Add by sevens to 102, beginning 4, 11, 18. Add by sevens to 103, beginning 5, 12, 19. Add by sevens to 104, beginning 6, 13, 20.

0, 7, 14, 21, 28, 35, 42, 49, 56, 63, 70, 77, 84, 91, 98, 105.
1, 8, 15, 22, 29, 36, 43, 50, 57, 64, 71, 78, 85, 92, 99, 106.
2, 9, 16, 23, 30, 37, 44, 51, 58, 65, 72, 79, 86, 93, 100.
3, 10, 17, 24, 31, 38, 45, 52, 59, 66, 73, 80, 87, 94, 101.
4, 11, 18, 25, 32, 39, 46, 53, 60, 67, 74, 81, 88, 95, 102.
5, 12, 19, 26, 33, 40, 47, 54, 61, 68, 75, 82, 89, 96, 103.
6, 13, 20, 27, 34, 41, 48, 55, 62, 69, 76, 83, 90, 97, 104.

Add by eights to 104, beginning 0, 8, 16. Add by eights to 105, beginning 1, 9, 17. Add by eights to 106, beginning 2, 10, 18. Add by eights to 107, beginning 3, 11, 19. Add by eights to 100, beginning 4, 12, 20. Add by eights to 101, beginning 5, 13, 21. Add by eights to 102, beginning 6, 14, 22. Add by eights to 103, beginning 7, 15, 23.

0, 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96, 104.
1, 9, 17, 25, 33, 41, 49, 57, 65, 73, 81, 89, 97, 105.
2, 10, 18, 26, 34, 42, 50, 58, 66, 74, 82, 90, 98, 106.
3, 11, 19, 27, 35, 43, 51, 59, 67, 75, 83, 91, 99, 107.
4, 12, 20, 28, 36, 44, 52, 60, 68, 76, 84, 92, 100.
5, 13, 21, 29, 37, 45, 53, 61, 69, 77, 85, 93, 101.
6, 14, 22, 30, 38, 46, 54, 62, 70, 78, 86, 94, 102.
7, 15, 23, 31, 39, 47, 55, 63, 71, 79, 87, 95, 103.

Add by nines to 108, beginning 0, 9, 18. Add by nines to 100, beginning 1, 10, 19. Add by nines to 101, beginning 2, 11, 20. Add by nines to 102, beginning 3, 12, 21. Add by nines to 103, beginning 4, 13, 22. Add by nines to 104, beginning 5, 14, 23. Add by nines to 105, beginning 6, 15, 24. Add by nines to 106, beginning 7, 16, 25. Add by nines to 107, beginning 8, 17, 26.

0, 9, 18, 27, 36, 45, 54, 63, 72, 81, 90, 99, 108.
1, 10, 19, 28, 37, 46, 55, 64, 73, 82, 91, 100.

2, 11, 20, 29, 38, 47, 56, 65, 74, 83, 92, 101.
3, 12, 21, 30, 39, 48, 57, 66, 75, 84, 93, 102.
4, 13, 22, 31, 40, 49, 58, 67, 76, 85, 94, 103.
5, 14, 23, 32, 41, 50, 59, 68, 77, 86, 95, 104.
6, 15, 24, 33, 42, 51, 60, 69, 78, 87, 96, 105.
7, 16, 25, 34, 43, 52, 61, 70, 79, 88, 97, 106.
8, 17, 26, 35, 44, 53, 62, 71, 80, 89, 98, 107.

Ex. 13. (*Oral.*) Page 17.

Find the sums of:

1.	3	2	4	5	4	5	6	7	4	3
	5	1	2	3	3	2	3	2	3	2
	4	3	3	4	2	1	4	3	2	7
	12	6	9	12	9	8	13	12	9	12
2.	3	4	5	6	5	7	8	3	4	5
	4	2	4	2	4	2	1	2	3	2
	1	3	2	3	2	3	0	4	2	3
	8	9	11	11	11	12	9	9	9	10
3.	4	5	3	5	4	3	8	6	7	8
	2	2	4	3	1	5	1	2	9	6
	3	1	3	2	3	2	3	5	4	9
	9	8	10	10	8	10	12	13	20	23
4.	1	8	7	6	7	9	5	7	9	6
	3	6	5	7	2	8	6	3	8	7
	5	1	7	9	9	9	4	9	1	8
	9	15	19	22	18	26	15	19	18	21
5.	7	6	5	9	7	6	5	3	9	5
	2	4	5	0	6	6	9	8	9	8
	3	3	4	8	4	6	8	7	9	7
	12	13	14	17	17	18	22	18	27	20

6.	3	5	7	6	8	9	7	6	9	8
	9	6	2	3	5	6	5	3	8	8
	7	8	5	4	4	4	7	5	8	8
	19	19	14	13	17	19	19	14	25	24

7.	6	6	7	7	4	4	3	5	3	6
	2	5	8	7	9	4	8	5	7	8
	5	3	9	7	4	4	7	5	7	7
	13	14	24	21	17	12	18	15	17	21

8.	8	3	2	3	5	5	9	4	2	2
	4	3	2	4	4	6	3	7	9	2
	4	3	9	8	8	6	6	5	8	8
	16	9	13	15	17	17	18	16	19	12

9.	9	5	7	8	9	6	7	4	5	8
	9	6	7	4	5	7	4	3	4	2
	7	6	5	7	5	6	8	9	7	9
	25	17	19	19	19	19	19	16	16	19

10.	3	2	2	3	6	8	7	8	9	6
	8	9	2	3	7	5	2	2	8	9
	7	8	9	7	4	4	3	2	7	7
	18	19	13	13	17	17	12	12	24	22

Ex. 14. Page 19.

Find the sums of:

1.	5	9	6	4	5	7	1	7	8	2
	4	5	4	6	8	3	4	3	4	6
	8	7	9	5	7	8	5	6	3	9
	6	3	7	2	3	6	3	8	2	7
	4	8	5	8	4	9	8	5	7	4
	7	4	8	6	8	2	6	4	8	5
	3	9	2	9	5	7	7	3	2	3
	5	7	6	4	9	3	9	6	8	5
	42	52	47	44	49	45	43	42	42	41

2.	8	5	4	4	5	2	3	5	3	6
	2	3	2	2	3	6	8	3	8	4
	4	6	5	5	2	4	6	8	4	7
	9	8	9	7	8	5	7	9	9	3
	3	2	7	6	4	3	9	5	7	5
	7	8	6	9	8	5	5	7	3	8
	6	5	9	4	6	3	4	6	8	6
	5	3	4	3	2	7	8	9	6	7
	2	4	1	8	1	9	2	4	2	9
	—	—	—	—	—	—	—	—	—	—
	46	44	47	48	39	44	52	56	50	55

3.	7	5	4	2	4	8	4	6	9	7
	3	6	4	6	8	7	9	8	3	9
	5	7	9	8	6	3	6	0	8	6
	8	3	6	4	7	5	7	4	2	3
	2	9	7	7	4	5	4	5	8	4
	8	4	9	9	5	4	3	3	7	5
	6	2	3	8	4	7	7	6	3	8
	3	8	7	2	6	9	6	9	4	6
	4	1	7	3	2	9	2	7	6	8
	—	—	—	—	—	—	—	—	—	—
	46	45	56	49	46	57	48	48	50	56

4.	6	5	9	8	5	9	8	7	9	6
	8	8	5	6	9	6	4	9	3	8
	5	3	3	7	4	7	5	6	8	3
	3	7	4	9	3	5	9	3	9	5
	7	9	9	5	7	9	7	4	8	3
	4	4	6	8	2	8	6	5	7	6
	6	8	8	4	9	3	8	8	3	9
	8	3	2	3	6	9	3	6	4	5
	2	6	1	2	8	4	2	1	0	2
	—	—	—	—	—	—	—	—	—	—
	49	53	47	52	53	60	52	49	51	47

5.	8	5	3	8	6	3	5	1	3	4
	5	9	9	6	5	4	5	3	3	3
	5	6	1	4	7	7	6	5	3	2
	1	1	1	3	4	3	1	8	2	6
	1	1	8	4	9	1	5	5	9	1
	9	7	1	0	3	4	1	7	6	6
	7	7	9	4	9	3	1	4	2	7
	1	1	3	3	1	1	1	0	9	8
	6	4	7	9	2	9	8	9	8	9
	—	—	—	—	—	—	—	—	—	—
	43	41	42	41	46	35	33	42	45	46

Ex. 15. Page 20.

Find the sums of:

1.	2.	3.	4.	5.	6.
50	40	60	30	10	80
20	80	50	10	70	90
70	20	80	90	10	30
60	30	20	40	90	80
30	70	50	20	40	60
90	80	30	50	70	30
80	60	40	70	30	40
10	50	70	80	20	50
410	430	400	390	340	460

7.	8.	9.	10.	11.	12.
40	80	52	30	42	60
21	70	60	23	40	40
90	31	70	52	50	32
50	42	30	91	80	54
83	60	81	70	70	90
70	51	42	33	34	82
62	90	50	80	90	91
416	424	385	379	406	449

13.	14.	15.	16.	17.	18.
51	56	48	36	25	17
46	63	31	42	52	82
30	72	45	50	49	25
25	81	82	81	38	13
32	17	19	14	41	80
47	26	21	35	57	45
231	315	246	258	262	262

19.	20.	21.	22.	23.	24.
18	57	15	44	19	91
24	31	8	21	27	42
91	28	23	36	48	36
33	63	70	8	39	82
64	90	61	14	7	71
75	9	55	27	9	54
37	81	83	59	87	65
342	359	315	209	236	441

25.	**26.**	**27.**	**28.**	**29.**	**30.**
48	52	8	16	33	54
9	61	43	48	52	46
17	26	52	85	27	8
29	28	67	7	38	19
83	83	9	26	41	92
75	94	17	35	9	57
21	77	84	54	94	83
282	421	280	271	294	359

31.	**32.**	**33.**	**34.**	**35.**	**36.**
55	68	9	13	48	35
67	5	23	99	6	42
78	43	25	7	51	57
9	67	68	85	9	64
4	25	79	64	23	49
18	14	7	39	88	87
231	222	211	307	225	334

Add:

Ex. 16. Page 22.

1.	**2.**	**3.**	**4.**	**5.**
123	516	321	225	871
205	341	75	716	215
310	236	184	348	64
79	110	769	519	371
118	196	815	96	296
835	1399	2164	1904	1817

6.	**7.**	**8.**	**9.**	**10.**
123	205	310	79	118
516	341	236	110	196
321	75	184	769	815
225	716	348	519	96
871	215	64	371	296
2056	1552	1142	1848	1521

11.	**12.**	**13.**	**14.**	**15.**
213	421	85	231	526
327	87	222	624	448
98	116	376	785	379
716	615	584	923	87
825	399	972	84	999
2179	1638	2239	2647	2439

16.	17.	18.	19.	20.
213	327	98	716	825
421	87	116	615	379
85	222	376	584	972
231	624	785	923	84
526	448	379	87	999
1476	1708	1754	2925	3259

Ex. 17. Page 23.

Add:

1.	2.	3.	4.
1234	4321	2345	345
368	6450	3456	2783
5721	378	4567	1497
1050	4291	5678	5840
4862	5782	689	9010
9215	6431	7890	2709
22450	27653	24625	22184

5.	6.	7.	8.
5207	3426	2358	9210
3584	783	7291	1029
2671	5279	5946	291
987	1085	7368	3587
3512	9270	5492	2785
6705	876	876	8899
22666	20719	29331	25801

Ex. 18. Page 23.

Add:

1.	2.	3.	4.
12345	23456	5	92583
3275	72564	23	4620
4721	3785	936	973
371	23584	6543	25
51028	987	92840	9
61234	96	72104	17
132974	124472	172451	98227

5.	6.	7.	8.
23504	358	56789	123456
4368	9246	3587	258071
25	14376	296	589347
9	845	89	258923
36	29	7	720145
378	7	12345	396012
28320	24861	73113	2345954

9.	10.	11.	12.	13.
580921	654321	5	345	584321
42364	41058	24	6197	92047
527913	3792	358	52718	3681
80235	589	1497	6904	927
726048	75	36725	871	1078
4386	9	187348	89	92569
1961867	699844	225957	67124	774623

Ex. 19. Page 24.

Add:

1.	2.	3.	4.	5.
5203461	2587609	1357924	8274108	5791350
9350472	3582764	6804281	3509270	246801
1456849	1357908	5975325	4680259	1384650
2604030	4670253	7101584	3584672	2794589
5876543	8492056	9276432	9876543	6532108
1234567	4759841	6789009	5279614	7999888
25725922	25450431	37304555	35204466	24749386

Ex. 20. Page 26.

1.	2.	3.	4.	5.	6.
427	483	15	41	39	327
342	1000	603	725	876	4960
856	8000	1145	60	5742	5000
728	648	6342	425	3000	749
	3750		7000	478	3000
	9840		4900	9873	7849
			398		
2353	23721	8105	13549	20008	21885

7. 4284
32
679
43
5006
7897

17941

8. 325
6007
983
4050
678
9874

21917

9. 856
9193
8765
4287
6696
9185
979

39961

10. 7964
5000
303
9784
5673
9004

37728

11. 9007
34
6876
400
9344
7879

33540

12. 45678
96
375
4784
9673
11980

72586

13. 7865
3586
4321
8576

24348

14. 900542
308970
555674
498785

2263971

15. 456789
304590
600792
480893
514763

2357827

16. 357963
478497
323484
596372
300409

2056725

17. 706963
78405
907342
503476

2196186

18. A man bought a sleigh for $142, a carriage for $325, and a pair of horses for $476. What was the cost of all?

$142
325
476

$943 *Ans.*

19. A man collected on Monday, $1290; on Tuesday, $340; on Wednesday, $1008. How much was collected in all?

$1290
340
1008

$2638 *Ans.*

20. A lady paid $912 for a piano, $342 for furniture, $187 for linen, $46 for silver. What did she pay for all?

$912
342
187
46

$1487 *Ans.*

21. A farmer had in one flock of sheep, 407; in another, 96; and in a third, 2584. How many had he in all?

407
96
2584

3087 *Ans.*

22. A man owns four houses; the first is worth $47,050; the second, $9106; the third, $1492; the fourth, $512. What is the value of them all?

$47,050
9,106
1,492
512
$58,160 *Ans.*

23. Five loads of flour weighed as follows: 3500 pounds, 4967 pounds, 3974 pounds, 7982 pounds, 7963 pounds. What was the weight of the whole?

3500
4967
3974
7982
7963
28,386 pounds. *Ans.*

24. A house was bought for $7895; repairs amounted to $1500; new fences, $97; repairs on stable, $463; furniture, $1285. What was the cost of the whole?

$7895
1500
97
463
1285
$11,240 *Ans.*

25. The population of six towns is: 1674, 9008, 3769, 4000, 7096, 3784. Find the whole population.

1674
9008
3769
4000
7096
3784
29,331 *Ans.*

26. A house lot cost $675; for building the house and furnishing materials the carpenters were paid $2245, the masons $540, the painters $320. What was expended on house and lot?

$675
2245
540
320
$3780 *Ans.*

27. A merchant bought carpets to the amount of $4670; curtains, $300; paper-hangings, $1275; matting, $9765. What was the cost of the whole?

$4670
300
1275
9765
$16,010 *Ans.*

28. Find the sum of three hundred thousand six hundred fifty, seven thousand eight hundred thirty-two, eleven thousand five hundred sixty-seven, ten thousand fifty-six, four hundred seventy-two.

300,650
7,832
11,567
10,056
472
330,577 *Ans.*

29. Find the sum of one hundred sixty-seven thousand, three hundred sixty-seven thousand, nine hundred six thousand, two hundred forty-seven thousand, ten thousand, seven hundred thousand, nine hundred seventy-six thousand, one hundred ninety-five thousand, ninety-seven thousand.

167,000
367,000
906,000
247,000
10,000
700,000
976,000
195,000
97,000

3,665,000 *Ans.*

30. Find the sum of two hundred seven, three hundred sixty-two, nine hundred forty-five, two thousand three hundred forty-three, fifteen thousand six hundred twenty-two, forty-five thousand eight.

207
362
945
2,343
15,622
45,008

64,487 *Ans.*

31. Add 3 thousand 4 hundred 92, one thousand four, 6 thousand 5 hundred seventy, 42 hundred eleven.

3492
1004
6570
4211

15,277 *Ans.*

32. Add 386 million 591, 546 million 311 thousand 122, 796 thousand 351, 84 hundred 1, 9 thousand, 86 thousand 521, 3 hundred fifty-eight thousand 6 hundred, 8 million 888 thousand eight hundred eighty-eight, 1 hundred million.

386,000,591
546,311,122
796,351
8,401
9,000
86,521
358,600
8,888,888
100,000,000

1,042,459,474 *Ans.*

33. Find the sum of six million sixty thousand six, seven million nine hundred fifty thousand ninety-nine, ten million nine thousand eight hundred seven, three hundred sixty-seven thousand forty-five.

6,060,006
7,950,099
10,009,807
367,045

24,386,957 *Ans.*

34. Find the sum of 200 million 302 thousand, 200 thousand two hundred, 50 million 50 thousand 50, 25 million 860 thousand, 47 million 467 thousand, 202 million 6367.

200,302,000
200,200
50,050,050
25,860,000
47,467,000
202,006,367

525,885,617 *Ans.*

35. What is the sum of eighteen thousand three hundred twenty, seventy-four thousand five hundred six, ten hundred seventeen thousand nine hundred twenty-one, fifty-three thousand seven hundred eleven, five hundred seventy-six thousand three hundred four, six hundred fifty thousand forty-four?

18,320
74,506
1,017,921
53,711
576,304
650,044

2,390,806 *Ans.*

36. A man drew five loads of bricks; in the first load there were 4068; in the second, 1342; in the third, 3927; in the fourth, 1694; in the fifth, 2009. How many in all the loads?

4068
1342
3927
1694
2009

13,040 *Ans.*

37. What is the united population of the following cities: Utica, 28,804; Lowell, 40,928; Lynn, 28,236; Salem, 24,100; Erie, 19,500; Auburn, 17,225?

28,804
40,928
28,236
24,100
19,500
17,225

158,793 *Ans.*

38. A fruit-grower sent to market the produce of six peach orchards; from the first, 7000 baskets; from the second, 6973; from the third, 1004; from the fourth, 3276; from the fifth, 1594; from the sixth, 3976. How many baskets in all?

7000
6973
1004
3276
1594
3976

23,823 *Ans.*

39. The distance from Boston to Springfield is 98 miles, from Springfield to New Haven 62 miles, from New Haven to New York 76 miles. How many miles is it from Boston to New York?

98
62
76

236 *Ans.*

40. An army officer paid at one time $7038 for horses, at another time $7776, at another time $9948. How many dollars did he pay in all?

$7038
7776
9948

$24,762 *Ans.*

41. A farmer sold his wheat for $8742, his corn for $13,569, and his oats for $9528. How much did he receive for the whole?

$8,742
13,569
9,528

$31,839 *Ans.*

42. A bank has $40,317 in specie, $91,256 in bills, $18,317 in cash items. Find the whole amount.

$40,317
91,256
18,317

$149,890 *Ans.*

43. The army of Napoleon at Waterloo consisted of 48,950 infantry, 15,765 cavalry, 7732 artillery. What was the whole number?

48,950
15,765
7,732

72,447 *Ans.*

44. The Duke of Wellington's army at Waterloo consisted of 20,661 infantry, 8735 cavalry, 6877 artillery. There were also 33,413 allies. What was the whole number of his army?

20,661
8,735
6,877
33,413

69,686 *Ans.*

45. The area of England is 50,535 square miles, of Scotland 29,167 square miles, and of Wales 8125 square miles. How many square miles in England, Scotland, and Wales together?

50,535
29,167
8,125

87,827 *Ans.*

46. New Hampshire furnished 12,497 soldiers for the Revolution, Massachusetts 67,907, Rhode Island

5908, Connecticut 31,939. How many did these four states furnish?

$$\begin{array}{r} 12{,}497 \\ 67{,}907 \\ 5{,}908 \\ \underline{31{,}939} \\ 118{,}251 \text{ \textit{Ans.}} \end{array}$$

47. A country merchant has in his store flour worth $656, sugar worth $480, molasses worth $325, cotton cloth worth $125, tea worth $56, canned goods worth $78. What is the whole value of his goods?

$$\begin{array}{r} \$656 \\ 480 \\ 325 \\ 125 \\ 56 \\ \underline{78} \\ \$1720 \text{ \textit{Ans.}} \end{array}$$

48. A farmer sold four loads of hay. The first weighed 2007 pounds, the second 1963 pounds, the third 2585 pounds, the fourth 2614 pounds. How many pounds did the whole weigh?

$$\begin{array}{r} 2007 \\ 1963 \\ 2585 \\ \underline{2614} \\ 9169 \text{ \textit{Ans.}} \end{array}$$

49. If Abraham was born at the beginning of the year B.C. 1996, how many years from the date of his birth to the end of the year 1889?

$$\begin{array}{r} 1996 \\ \underline{1889} \\ 3885 \text{ \textit{Ans.}} \end{array}$$

50. An orchard contains 112 apple trees, and an equal number of pear trees; 56 peach trees, and an equal number of plum trees; and 19 cherry trees. How many trees are there in the orchard?

$$\begin{array}{r} 112 \\ 112 \\ 56 \\ 56 \\ \underline{19} \\ 355 \text{ \textit{Ans.}} \end{array}$$

51. How many times does a clock strike from half past twelve o'clock at night to half past twelve o'clock at noon?

$$\begin{array}{r} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ \underline{12} \\ 78 \text{ \textit{Ans.}} \end{array}$$

52. The area of Maine in square miles is 29,895, of New Hampshire 9005, of Vermont 9135, of Massachusetts 8040, of Rhode Island 1085, of Connecticut 4845. What is the area of New England in square miles?

29,895
9,005
9,135
8,040
1,085
4,845
62,005 *Ans.*

53. The area of New York in square miles is 47,620, of Pennsylvania 44,985, of Virginia 40,125, of North Carolina 48,580, of Ohio 40,760. What is the area of these five states in square miles?

47,620
44,985
40,125
48,580
40,760
222,070 *Ans.*

54. The area of Illinois in square miles is 56,000, of Michigan 57,430, of Wisconsin 54,450, of Iowa 55,475, of Missouri 68,735. What is the area of these five states in square miles?

56,000
57,430
54,450
55,475
68,735
292,090 *Ans.*

55. The area of Texas in square miles is 262,290, of California 155,980, of Dakota 147,700, of Montana 145,310, of New Mexico 122,460, of Arizona 112,920. Find their total area in square miles.

262,290
155,980
147,700
145,310
122,460
112,920
946,660 *Ans.*

Ex. 21. (*Oral.*) Page 33.

1. What number with 5 makes 10? 5.
What number with 3 makes 10? 7.
What number with 2 makes 10? 8.
What number with 4 makes 10? 6.

2. What number taken from 10 leaves 2? 8.
What number taken from 10 leaves 4? 6.
What number taken from 10 leaves 3? 7.
What number taken from 10 leaves 5? 5.

3. 5 is one part of 12, what is the other? 7.
8 is one part of 12, what is the other? 4.
3 is one part of 12, what is the other? 9.
7 is one part of 12, what is the other? 5.
9 is one part of 12, what is the other? 3.
6 is one part of 12, what is the other? 6.
10 is one part of 12, what is the other? 2.

4. What number taken from 12 leaves 11? 1.
What number taken from 12 leaves 9? 3.
What number taken from 12 leaves 5? 7.
What number taken from 12 leaves 8? 4.
What number taken from 12 leaves 2? 10.
What number taken from 12 leaves 6? 6.
What number taken from 12 leaves 7? 5.
What number taken from 12 leaves 1? 11.

5. $9 + 2 = 11.$ $\therefore 11 - 2 = 9,$ and $11 - 9 = 2.$
$8 + 3 = 11.$ $\therefore 11 - 3 = 8,$ and $11 - 8 = 3.$
$6 + 5 = 11.$ $\therefore 11 - 5 = 6,$ and $11 - 6 = 5.$
$10 + 1 = 11.$ $\therefore 11 - 1 = 10,$ and $11 - 10 = 1.$

6. $8 + 5 = 13.$ $\therefore 13 - 5 = 8,$ and $13 - 8 = 5.$
$6 + 7 = 13.$ $\therefore 13 - 7 = 6,$ and $13 - 6 = 7.$
$9 + 4 = 13.$ $\therefore 13 - 4 = 9,$ and $13 - 9 = 4.$

7. $6 + 8 = 14.$ $\therefore 14 - 6 = 8,$ and $14 - 8 = 6.$
$5 + 9 = 14.$ $\therefore 14 - 9 = 5,$ and $14 - 5 = 9.$
$7 + 7 = 14.$ $\therefore 14 - 7 = 7.$

8. $7 + 8 = 15.$ $\therefore 15 - 7 = 8,$ and $15 - 8 = 7.$
$9 + 6 = 15.$ $\therefore 15 - 6 = 9,$ and $15 - 9 = 6.$
$9 + 3 = 12.$ $\therefore 12 - 9 = 3,$ and $12 - 3 = 9.$

9. $8 + 8 = 16.$ $\therefore 16 - 8 = 8.$
$7 + 9 = 16.$ $\therefore 16 - 7 = 9,$ and $16 - 9 = 7.$
$9 + 8 = 17.$ $\therefore 17 - 9 = 8,$ and $17 - 8 = 9.$

10. Subtract by threes, from 100 to 1; from 102 to 0; by fours, from 101 to 1; from 102 to 2; from 103 to 3.

100, 97, 94, 91, 88, 85, 82, 79, 76, 73, 70, 67, 64, 61, 58, 55, 52, 49, 46, 43, 40, 37, 34, 31, 28, 25, 22, 19, 16, 13, 10, 7, 4, 1.

102, 99, 96, 93, 90, 87, 84, 81, 78, 75, 72, 69, 66, 63, 60, 57, 54, 51, 48, 45, 42, 39, 36, 33, 30, 27, 24, 21, 18, 15, 12, 9, 6, 3, 0.

101, 97, 93, 89, 85, 81, 77, 73, 69, 65, 61, 57, 53, 49, 45, 41, 37, 33, 29, 25, 21, 17, 13, 9, 5, 1.

102, 98, 94, 90, 86, 82, 78, 74, 70, 66, 62, 58, 54, 50, 46, 42, 38, 34, 30, 26, 22, 18, 14, 10, 6, 2.

103, 99, 95, 91, 87, 83, 79, 75, 71, 67, 63, 59, 55, 51, 47, 43, 39, 35, 31, 27, 23, 19, 15, 11, 7, 3.

11. Subtract by fives from 102 to 2; from 103 to 3; from 104 to 4; from 100 to 5.

102, 97, 92, 87, 82, 77, 72, 67, 62, 57, 52, 47, 42, 37, 32, 27, 22, 17, 12, 7, 2,

103, 98, 93, 88, 83, 78, 73, 68, 63, 58, 53, 48, 43, 38, 33, 28, 23, 18, 13, 8, 3.

104, 99, 94, 89, 84, 79, 74, 69, 64, 59, 54, 49, 44, 39, 34, 29, 24, 19, 14, 9, 4.

100, 95, 90, 85, 80, 75, 70, 65, 60, 55, 50, 45, 40, 35, 30, 25, 20, 15, 10, 5.

12. Subtract by sixes, from 103 to 1; from 104 to 2; from 105 to 3; from 100 to 4; from 102 to 6.

103, 97, 91, 85, 79, 73, 67, 61, 55, 49, 43, 37, 31, 25, 19, 13, 7, 1.

104, 98, 92, 86, 80, 74, 68, 62, 56, 50, 44, 38, 32, 26, 20, 14, 8, 2.

105, 99, 93, 87, 81, 75, 69, 63, 57, 51, 45, 39, 33, 27, 21, 15, 9, 3.

100, 94, 88, 82, 76, 70, 64, 58, 52, 46, 40, 34, 28, 22, 16, 10, 4.

102, 96, 90, 84, 78, 72, 66, 60, 54, 48, 42, 36, 30, 24, 18, 12, 6.

13. Subtract by sevens, from 106 to 1; from 100 to 2; from 101 to 3; from 102 to 4; from 103 to 5; from 104 to 6; from 105 to 7.

106, 99, 92, 85, 78, 71, 64, 57, 50, 43, 36, 29, 22, 15, 8, 1.

100, 93, 86, 79, 72, 65, 58, 51, 44, 37, 30, 23, 16, 9, 2.

101, 94, 87, 80, 73, 66, 59, 52, 45, 38, 31, 24, 17, 10, 3.

102, 95, 88, 81, 74, 67, 60, 53, 46, 39, 32, 25, 18, 11, 4.

103, 96, 89, 82, 75, 68, 61, 54, 47, 40, 33, 26, 19, 12, 5.

104, 97, 90, 83, 76, 69, 62, 55, 48, 41, 34, 27, 20, 13, 6.

105, 98, 91, 84, 77, 70, 63, 56, 49, 42, 35, 28, 21, 14, 7.

14. Subtract by eights, from 105 to 1; from 106 to 2; from 107 to 3; from 100 to 4; from 101 to 5; from 102 to 6; from 103 to 7; from 104 to 8.

105, 97, 89, 81, 73, 65, 57, 49, 41, 33, 25, 17, 9, 1.
106, 98, 90, 82, 74, 66, 58, 50, 42, 34, 26, 18, 10, 2.
107, 99, 91, 83, 75, 67, 59, 51, 43, 35, 27, 19, 11, 3.
100, 92, 84, 76, 68, 60, 52, 44, 36, 28, 20, 12, 4.
101, 93, 85, 77, 69, 61, 53, 45, 37, 29, 21, 13, 5.
102, 94, 86, 78, 70, 62, 54, 46, 38, 30, 22, 14, 6.
103, 95, 87, 79, 71, 63, 55, 47, 39, 31, 23, 15, 7.
104, 96, 88, 80, 72, 64, 56, 48, 40, 32, 24, 16, 8.

15. Subtract by nines, from 100 to 1; from 101 to 2; from 102 to 3; from 103 to 4; from 104 to 5; from 105 to 6; from 106 to 7.

100, 91, 82, 73, 64, 55, 46, 37, 28, 19, 10, 1.
101, 92, 83, 74, 65, 56, 47, 38, 29, 20, 11, 2.
102, 93, 84, 75, 66, 57, 48, 39, 30, 21, 12, 3.
103, 94, 85, 76, 67, 58, 49, 40, 31, 22, 13, 4.
104, 95, 86, 77, 68, 59, 50, 41, 32, 23, 14, 5.
105, 96, 87, 78, 69, 60, 51, 42, 33, 24, 15, 6.
106, 97, 88, 79, 70, 61, 52, 43, 34, 25, 16, 7.

Ex. 22. (*Oral.*) Page 35.

$5 + 4 = 9.\ \therefore\ 9 - 5 = 4;\ 9 - 4 = 5.$
$9 + 3 = 12.\ \therefore\ 12 - 9 = 3;\ 12 - 3 = 9.$
$6 + 5 = 11.\ \therefore\ 11 - 6 = 5;\ 11 - 5 = 6.$
$7 + 6 = 13.\ \therefore\ 13 - 7 = 6;\ 13 - 6 = 7.$
$9 + 6 = 15.\ \therefore\ 15 - 6 = 9;\ 15 - 9 = 6.$
$7 + 9 = 16.\ \therefore\ 16 - 9 = 7;\ 16 - 7 = 9.$

$14 - 8 = 6.$
$11 - 3 = 8.$
$16 - 7 = 9.$
$17 - 8 = 9.$
$12 - 4 = 8.$
$15 - 7 = 8.$

$16 - 9 = 7.$
$33 - 8 = 25.$
$24 - 9 = 15.$
$35 - 8 = 27.$
$44 - 7 = 37.$
$68 - 9 = 59.$

$18 - 6 = 12.$
$45 - 6 = 39.$
$37 - 8 = 29.$
$43 - 7 = 36.$
$24 - 8 = 16.$
$56 - 7 = 49.$

$17 - 8 = 9.$
$76 - 8 = 68.$
$48 - 6 = 42.$
$50 - 4 = 46.$
$31 - 3 = 28.$
$43 - 5 = 38.$

$25 - 9 = 16.$
$32 - 9 = 23.$
$53 - 9 = 44.$
$63 - 6 = 57.$
$26 - 9 = 17.$
$29 - 7 = 22.$

13 − 6 = 7.
11 − 8 = 3.
27 − 9 = 18.
32 − 8 = 24.
25 − 4 = 21.
17 − 9 = 8.
42 − 3 = 39.
37 − 9 = 28.
24 − 7 = 17.
45 − 8 = 37.
19 − 8 = 11.
34 − 6 = 28.
28 − 9 = 19.
54 − 5 = 49.

27 − 8 = 19.
13 − 8 = 5.
86 − 8 = 78.
73 − 5 = 68.
75 − 9 = 66.
31 − 8 = 23.
30 − 6 = 24.
58 − 9 = 49.
70 − 8 = 62.
42 − 3 = 39.
60 − 3 = 57.
95 − 6 = 89.
72 − 7 = 65.
77 − 8 = 69.

34 − 9 = 25.
15 − 8 = 7.
85 − 9 = 76.
62 − 7 = 55.
73 − 7 = 66.
42 − 9 = 33.
38 − 9 = 29.
52 − 6 = 46.
21 − 9 = 12.
54 − 7 = 47.
65 − 9 = 56.
82 − 8 = 74.
90 − 9 = 81.
85 − 7 = 78.

40 − 9 = 31.
13 − 9 = 4.
87 − 6 = 81.
26 − 9 = 17.
72 − 6 = 66.
50 − 3 = 47.
40 − 4 = 36.
63 − 8 = 55.
22 − 7 = 15.
71 − 8 = 63.
64 − 6 = 58.
79 − 9 = 70.
65 − 6 = 59.
69 − 9 = 60.

50 − 7 = 43.
31 − 3 = 28.
84 − 5 = 79.
23 − 7 = 16.
83 − 8 = 75.
39 − 8 = 31.
93 − 7 = 86.
41 − 3 = 38.
38 − 9 = 29.
65 − 7 = 58.
17 − 9 = 8.
76 − 8 = 68.
81 − 7 = 74.
71 − 4 = 67.

Ex. 23. Page 36.

1. 59 − 23 = 36.
2. 54 − 23 = 31.
3. 67 − 14 = 53.
4. 65 − 32 = 33.
5. 78 − 25 = 53.
6. 75 − 41 = 34.
7. 85 − 33 = 52.
8. 78 − 25 = 53.
9. 96 − 42 = 54.
10. 97 − 54 = 43.
11. 87 − 54 = 33.
12. 86 − 31 = 55.
13. 89 − 41 = 48.
14. 67 − 23 = 44.
15. 58 − 17 = 41.
16. 75 − 34 = 41.
17. 96 − 53 = 43.
18. 87 − 42 = 45.
19. 69 − 37 = 32.
20. 78 − 26 = 52.
21. 64 − 43 = 21.
22. 98 − 35 = 63.
23. 89 − 53 = 36.
24. 77 − 46 = 31.
25. 786 − 45 = 741.
26. 674 − 52 = 622.
27. 569 − 38 = 531.
28. 857 − 43 = 814.
29. 294 − 82 = 212.
30. 348 − 37 = 311.
31. 489 − 76 = 413.
32. 768 − 47 = 721.
33. 976 − 53 = 923.
34. 897 − 75 = 822.
35. 588 − 64 = 524.
36. 467 − 45 = 422.

37. 874
632
242

38. 792
261
531

39. 798
627
171

40.	764	532	232
41.	862	741	121
42.	6982	5431	1551
43.	7629	4518	3111
44.	7824	6821	1003
45.	8542	6131	2411
46.	8792	6281	2511
47.	725,419	613,208	112,211
48.	965,420	342,100	623,320
49.	854,267	723,150	131,117
50.	549,830	438,820	111,010
51.	628,300	517,200	111,100

Ex. 24. Page 38.

1.	867	325	542
2.	985	312	673
3.	746	213	533
4.	384	132	252
5.	479	235	244
6.	679	215	464
7.	857	324	533
8.	956	532	424
9.	795	362	433
10.	687	321	366
11.	978	333	645
12.	835	214	621
13.	90	35	55
14.	40	13	27
15.	70	26	44
16.	50	24	26
17.	80	32	48
18.	60	33	27
19.	60	47	13
20.	70	45	25

21. $\begin{array}{r}70\\52\\\hline 18\end{array}$

22. $\begin{array}{r}80\\36\\\hline 44\end{array}$

23. $\begin{array}{r}90\\28\\\hline 62\end{array}$

24. $\begin{array}{r}90\\27\\\hline 63\end{array}$

25. $\begin{array}{r}70\\28\\\hline 42\end{array}$

26. $\begin{array}{r}50\\13\\\hline 37\end{array}$

27. $\begin{array}{r}80\\37\\\hline 43\end{array}$

28. $\begin{array}{r}60\\48\\\hline 12\end{array}$

29. $\begin{array}{r}90\\25\\\hline 65\end{array}$

30. $\begin{array}{r}50\\27\\\hline 23\end{array}$

31. $\begin{array}{r}80\\43\\\hline 37\end{array}$

32. $\begin{array}{r}70\\36\\\hline 34\end{array}$

33. $\begin{array}{r}90\\32\\\hline 58\end{array}$

34. $\begin{array}{r}60\\27\\\hline 33\end{array}$

35. $\begin{array}{r}80\\49\\\hline 31\end{array}$

36. $\begin{array}{r}90\\36\\\hline 54\end{array}$

Ex. 25. Page 38.

1. $\begin{array}{r}52\\26\\\hline 26\end{array}$

2. $\begin{array}{r}73\\38\\\hline 35\end{array}$

3. $\begin{array}{r}81\\49\\\hline 32\end{array}$

4. $\begin{array}{r}94\\57\\\hline 37\end{array}$

5. $\begin{array}{r}72\\48\\\hline 24\end{array}$

6. $\begin{array}{r}91\\64\\\hline 27\end{array}$

7. $\begin{array}{r}75\\48\\\hline 27\end{array}$

8. $\begin{array}{r}92\\48\\\hline 44\end{array}$

9. $\begin{array}{r}83\\26\\\hline 57\end{array}$

10. $\begin{array}{r}95\\47\\\hline 48\end{array}$

11. $\begin{array}{r}86\\57\\\hline 29\end{array}$

12. $\begin{array}{r}95\\66\\\hline 29\end{array}$

13. $\begin{array}{r}63\\29\\\hline 34\end{array}$

14. $\begin{array}{r}74\\37\\\hline 37\end{array}$

15. $\begin{array}{r}92\\68\\\hline 24\end{array}$

16. $\begin{array}{r}81\\56\\\hline 25\end{array}$

17. $\begin{array}{r}75\\38\\\hline 37\end{array}$

18. $\begin{array}{r}96\\48\\\hline 48\end{array}$

19. $\begin{array}{r}85\\57\\\hline 28\end{array}$

20. $\begin{array}{r}93\\75\\\hline 18\end{array}$

21. 54	**25.** 680	**29.** 750	**33.** 860
18	247	419	247
36	433	331	613
22. 81	**26.** 570	**30.** 830	**34.** 970
27	236	214	358
54	334	616	612
23. 75	**27.** 860	**31.** 690	**35.** 580
29	218	275	149
46	642	415	431
24. 94	**28.** 690	**32.** 750	**36.** 870
58	254	326	146
36	436	424	724

Ex. 26. Page 38.

1. 407	**6.** 807	**11.** 476	**16.** 904
84	42	68	472
323	765	408	432
2. 308	**7.** 462	**12.** 852	**17.** 809
75	38	39	581
233	424	813	228
3. 609	**8.** 374	**13.** 608	**18.** 705
58	57	247	694
551	317	361	11
4. 205	**9.** 281	**14.** 706	**19.** 508
81	65	253	294
124	216	453	214
5. 506	**10.** 592	**15.** 805	**20.** 609
63	83	364	385
443	509	441	224

21.	707	**25.**	781	**29.**	763	**33.**	693
	246		246		419		447
	461		535		344		246
22.	806	**26.**	892	**30.**	655	**34.**	754
	324		387		247		536
	482		505		408		218
23.	405	**27.**	643	**31.**	461	**35.**	835
	132		418		239		226
	273		225		222		609
24.	709	**28.**	954	**32.**	572	**36.**	973
	328		216		238		237
	381		738		334		736

Ex. 27. Page 39.

1.	612	**6.**	324	**11.**	325	**16.**	936
	78		65		86		489
	534		259		239		447
2.	523	**7.**	942	**12.**	712	**17.**	567
	64		74		94		298
	459		868		618		269
3.	845	**8.**	635	**13.**	732	**18.**	715
	87		89		458		348
	758		546		274		367
4.	417	**9.**	522	**14.**	816	**19.**	623
	58		56		237		417
	359		466		579		206
5.	731	**10.**	417	**15.**	624	**20.**	861
	94		68		158		375
	637		349		466		486

21. 453 286 167	**25.** 531 352 179	**29.** 915 468 447	**33.** 624 248 376
22. 817 329 488	**26.** 642 263 379	**30.** 812 357 455	**34.** 512 136 376
23. 643 457 186	**27.** 763 174 589	**31.** 514 136 378	**35.** 713 364 349
24. 415 186 229	**28.** 824 296 528	**32.** 972 489 483	**36.** 817 259 558

Ex. 28. Page 39.

1. 500 78 422	**6.** 400 76 324	**11.** 902 94 808	**16.** 700 427 273
2. 600 83 517	**7.** 802 68 734	**12.** 504 69 435	**17.** 400 128 272
3. 700 92 608	**8.** 304 95 209	**13.** 600 235 365	**18.** 800 372 428
4. 800 64 736	**9.** 506 87 419	**14.** 800 217 583	**19.** 600 345 255
5. 600 57 543	**10.** 403 75 328	**15.** 900 386 514	**20.** 700 562 138

21. $\begin{array}{r}800\\427\\\hline 373\end{array}$	**25.** $\begin{array}{r}902\\146\\\hline 756\end{array}$	**29.** $\begin{array}{r}503\\267\\\hline 236\end{array}$	**33.** $\begin{array}{r}705\\258\\\hline 447\end{array}$
22. $\begin{array}{r}900\\368\\\hline 532\end{array}$	**26.** $\begin{array}{r}805\\347\\\hline 458\end{array}$	**30.** $\begin{array}{r}906\\387\\\hline 519\end{array}$	**34.** $\begin{array}{r}603\\318\\\hline 285\end{array}$
23. $\begin{array}{r}500\\321\\\hline 179\end{array}$	**27.** $\begin{array}{r}704\\215\\\hline 489\end{array}$	**31.** $\begin{array}{r}904\\328\\\hline 576\end{array}$	**35.** $\begin{array}{r}701\\427\\\hline 274\end{array}$
24. $\begin{array}{r}600\\487\\\hline 113\end{array}$	**28.** $\begin{array}{r}607\\238\\\hline 369\end{array}$	**32.** $\begin{array}{r}802\\467\\\hline 335\end{array}$	**36.** $\begin{array}{r}705\\348\\\hline 357\end{array}$

Ex. 29. Page 40.

1. $\begin{array}{r}7689\\2345\\\hline 5344\end{array}$	**6.** $\begin{array}{r}6789\\4321\\\hline 2468\end{array}$	**11.** $\begin{array}{r}9560\\1423\\\hline 8137\end{array}$	**16.** $\begin{array}{r}7200\\3647\\\hline 3553\end{array}$
2. $\begin{array}{r}6837\\4216\\\hline 2621\end{array}$	**7.** $\begin{array}{r}8470\\2138\\\hline 6332\end{array}$	**12.** $\begin{array}{r}8670\\4324\\\hline 4346\end{array}$	**17.** $\begin{array}{r}8300\\2746\\\hline 5554\end{array}$
3. $\begin{array}{r}9876\\1234\\\hline 8642\end{array}$	**8.** $\begin{array}{r}6790\\3245\\\hline 3545\end{array}$	**13.** $\begin{array}{r}8700\\3218\\\hline 5482\end{array}$	**18.** $\begin{array}{r}7400\\2843\\\hline 4557\end{array}$
4. $\begin{array}{r}8697\\3274\\\hline 5423\end{array}$	**9.** $\begin{array}{r}9580\\5136\\\hline 4444\end{array}$	**14.** $\begin{array}{r}9600\\2745\\\hline 6855\end{array}$	**19.** $\begin{array}{r}8020\\3647\\\hline 4373\end{array}$
5. $\begin{array}{r}7586\\2145\\\hline 5441\end{array}$	**10.** $\begin{array}{r}7480\\2367\\\hline 5113\end{array}$	**15.** $\begin{array}{r}9600\\4347\\\hline 5253\end{array}$	**20.** $\begin{array}{r}7050\\6873\\\hline 177\end{array}$

21. 6040 2895 3145	**22.** 8030 2746 5284	**23.** 7050 4873 2177	**24.** 6020 2748 3272

Ex. 30. Page 40.

1. 6005 2347 3658	**7.** 7035 2648 4387	**13.** 7000 2546 4454	**19.** 6324 2538 3786
2. 8002 2636 5366	**8.** 7023 2896 4127	**14.** 7000 3748 3252	**20.** 6245 3789 2456
3. 8003 2746 5257	**9.** 8021 3472 4549	**15.** 8000 5318 2682	**21.** 4517 1638 2879
4. 6005 2748 3257	**10.** 8064 2397 5667	**16.** 8000 3526 4474	**22.** 7253 4867 2386
5. 9004 2615 6389	**11.** 9012 3684 5328	**17.** 9000 3725 5275	**23.** 9215 4757 4458
6. 6003 2846 3157	**12.** 7054 2768 4286	**18.** 9000 2745 6255	**24.** 7214 4869 2345

Ex. 31. Page 40.

1. 56,739 24,316 32,423	**2.** 68,507 47,623 20,884	**3.** 47,865 12,341 35,524	**4.** 72,006 48,315 23,691

5. 65,043
17,872
47,171

6. 81,000
25,143
55,857

7. 90,000
30,906
59,094

8. 90,503
47,628
42,875

9. 41,009
31,214
9,795

10. 43,020
36,748
6,272

11. 26,735
9,856
16,879

12. 75,986
43,264
32,722

13. 59,001
16,739
42,262

14. 89,076
569
88,507

15. 60,020
24,156
35,864

16. 57,490
598
56,892

17. 70,000
25,487
44,513

18. 70,000
4,139
65,861

19. 60,300
36,428
23,872

20. 70,302
5,648
64,654

21. 80,040
23,619
56,421

22. 63,008
47,236
15,772

23. 50,004
47,825
2,179

24. 80,047
26,578
53,469

Ex. 32. Page 41.

1. 431,250
153,697
277,553

2. 920,503
476,829
443,674

3. 523,146
286,759
236,387

4. 647,352
268,574
378,778

5. 502,304
186,475
315,829

6. 625,030
274,384
350,646

7. 720,301
368,596
351,705

8. 842,003
459,687
382,316

9. 715,324
369,857
345,467

10. 900,500
465,783
434,717

11. 512,435
126,867
385,568

12. 600,000
285,436
314,564

13. 723,514
536,945
186,569

14. 801,050
469,872
331,178

Ex. 33. Page 41.

1. What number must be added to 7428 to make 8047?

8047
7428
619 *Ans.*

2. What number must be taken from 3015 to leave 2405?

3015
2405
610 *Ans.*

3. If the minuend is 78,206, and the subtrahend 35,264, what is the remainder?

78,206
35,264
42,942 *Ans.*

4. A man owed $4689. He paid at one time $3894. How much did he still owe?

$4689
3894
$795 *Ans.*

5. A flour merchant had on hand 2038 barrels of flour. He sold 1299 barrels. How many barrels had he left?

2038
1299
739 *Ans.*

6. Mr. Brown's yearly income is $5067. His expenses are $4093. How much does he save?

$5067
4093
$ 974 *Ans.*

7. The population of New England in 1870 was 3,487,924, in 1880, 4,010,529. Find the increase.

4,010,529
3,487,924
522,605 *Ans.*

8. A house cost $9468. If payments to the amount of $5889 have been made to the builder, how much still remains due?

$9468
5889
$3579 *Ans.*

9. The sum of two numbers is 890,375, and one of them is 309,007. What is the other?

890,375
309,007
581,368 *Ans.*

10. A is worth $98,760; B is worth $4586 less than A. How much is B worth?

$98,760
4,586
$94,174 *Ans.*

11. In 1880 the population of Boston was 369,832, and the population of Baltimore was 332,313. How much greater was the population of Boston than that of Baltimore?

369,832
332,313
37,519 *Ans.*

12. A tank holding 370 gallons of water was filled by pouring 77 gallons into it. How many gallons were there already in the tank?

370
77
293 *Ans.*

13. What number increased by 15,639 will be 28,984?

28,984
15,639
13,345 *Ans.*

14. What number subtracted from nine hundred eighty-seven thousand three hundred fifty-nine will leave three hundred thousand two hundred eight?

987,359
300,208
687,151 *Ans.*

15. A cotton planter raised 9675 pounds of cotton. He sold 7876 pounds. How many pounds had he left?

9675
7876
1799 *Ans.*

16. There were 322 apples on a tree, of which 198 were gathered, and 87 were blown off by the wind. How many were left on the tree?

322
198
124
87
37 *Ans.*

17. There are 60 minutes in an hour; how many minutes between 4 minutes after 10 o'clock and 3 minutes before 11 o'clock? Between 9 minutes after 1 o'clock and 3 minutes before 2 o'clock?

60	60
7	12
53 *Ans.*	48 *Ans.*

18. A man purchases a farm for $24,669, and pays down $13,708. How much remains unpaid?

$24,669
13,708
$10,961 *Ans.*

19. Eight hundred seventy-six thousand four hundred twenty-five added to a certain number makes eleven million seven hundred nine thousand three hundred four. What is the number?

11,709,304
876,425
10,832,879 *Ans.*

20. Two men, A and B, start together from the same place and travel in the same direction. A walks the first day 29 miles, B rides the first day 67 miles. How many miles apart are they at the end of the first day? How many miles apart would they have been if they had travelled in *opposite* directions?

67 67
29 29
38 *Ans.* 96 *Ans.*

21. A merchant deposited in a bank $10,040; and afterwards drew a check for $3780. How much had he in the bank after the check was paid?

$10,040
3,780
$6,260 *Ans.*

22. What is the difference between 106,074 and 28,999?

106,074
28,999
77,075 *Ans.*

23. A man went to market with $10.25. He paid for steak $2; for sugar, $1; for coffee, $1; for fruit, $2; for flour, $2. How much money had he left?

$2 $10.25
1 8.00
1
2 $2.25 *Ans.*
2
$8

24. A horse cost $397 and was sold for $563. How much was gained?

$563
397
$166 *Ans.*

25. A horse and carriage were bought for $458, and were sold for $539. What was the gain?

$539
458
$81 *Ans.*

26. A cow was sold for $171.25. The cow cost $152. What was the gain?

$171.25
152.00
$19.25 *Ans.*

27. A man bought a house lot for $1290 and sold it for $1196. How much did he lose?

$1290
1196
$94 *Ans.*

28. A horse, harness, and saddle were bought for $378, and were sold for $423.50. How much was gained?

$423.50
378.00
$ 45.50 *Ans.*

29. A man owing $7862.50 has paid $5678. How much is still due?

$7862.50
5678.00
$2184.50 *Ans.*

30. From a $50 bank-note a bill of $38.50 was paid. What change was given back?

$50.00
38.50
$11.50 *Ans.*

31. In the siege of Gibraltar (1779–1783) the English fired 57,163 round shot, and the French 175,741. How many more did the French fire than the English?

175,741
57,163
118,578 *Ans.*

32. The length of the Missouri River from its source to the Mississippi is three thousand ninety-six miles, and from its source to the Gulf of Mexico four thousand five hundred six miles. How many miles is it from the junction of the two rivers to the Gulf of Mexico?

4506
3096
1410 *Ans.*

33. A lady bought articles in a store amounting to nine dollars and seventy-five cents. She gave in payment a ten-dollar bill. How much change should she receive?

$10.00
9.75
$ 0.25 *Ans.*

34. A gentleman received from his father $65,784. He paid for a house $28,598. How much had he left?

$65,784
28,598
$37,186 *Ans.*

35. If the area of the Mississippi Valley is 1,237,111 square miles, and the area of the Atlantic slope is 967,576 square miles, find the excess of the Mississippi Valley over the Atlantic slope in square miles.

1,237,111
967,576
269,535 *Ans.*

36. Lake Erie covers 9600 square miles, and Massachusetts contains 8040 square miles. How many more square miles in Lake Erie than in Massachusetts?

$$\begin{array}{r} 9600 \\ \underline{8040} \\ 1560 \end{array}$$ *Ans.*

37. The foreign immigration into the United States was, in 1883, 603,322, and in 1885, 395,346. How much greater was the number in 1883 than in 1885?

$$\begin{array}{r} 603,322 \\ \underline{395,346} \\ 207,976 \end{array}$$ *Ans.*

38. The consumption of imported sugar in the United States was, in 1882, 866,517 tons, and in 1880, 730,519 tons. How many more tons were consumed in 1882 than in 1880?

$$\begin{array}{r} 866,517 \\ \underline{730,519} \\ 135,998 \end{array}$$ *Ans.*

39. A lady bought goods amounting to two dollars and thirty-four cents. She gave a five-dollar bill in payment. What change should she receive?

$$\begin{array}{r} \$5.00 \\ \underline{2.34} \\ \$2.66 \end{array}$$ *Ans.*

40. The polar diameter of the earth is 41,707,620 feet, and the equatorial diameter is 41,847,426 feet. Find the difference in feet.

$$\begin{array}{r} 41,847,426 \\ \underline{41,707,620} \\ 139,806 \end{array}$$ *Ans.*

41. The Secretary of the Treasury of the United States estimated the revenue for 1885 to be $330,000,000. The actual revenue was $323,690,706. How much did the actual fall short of the estimated revenue?

$$\begin{array}{r} \$330,000,000 \\ \underline{323,690,706} \\ \$6,309,294 \end{array}$$ *Ans.*

42. The population of Chicago in 1860 was 109,260, in 1880, 503,185. Find the increase.

$$\begin{array}{r} 503,185 \\ \underline{109,260} \\ 393,925 \end{array}$$ *Ans.*

43. The gross earnings of the Eastern Railroad for 1883 were $3,584,506, and the expenses were $2,310,830. Find the net earnings for the year.

$$\begin{array}{r} \$3,584,506 \\ \underline{2,310,830} \\ \$1,273,676 \end{array}$$ *Ans.*

44. The population of New York City in 1880 was 1,206,299;

in 1860 it was 805,651. Find the increase for twenty years.

1,206,299
805,651
400,648 *Ans.*

45. In 1880 Kentucky raised 149,017,855 pounds of tobacco, and Virginia raised 78,421,860 pounds. How many more pounds did Kentucky raise than Virginia?

49,017,855
78,421,860
70,595,995 *Ans.*

46. The value of the tobacco raised in Kentucky in 1880 was $10,431,250; the value of that raised in Virginia was $6,273,749. Find the difference.

$10,431,250
6,273,749
$4,157,501 *Ans.*

47. The population of Massachusetts in 1880 was 1,783,085, and of Virginia 1,512,565. Find the difference.

1,783,085
1,512,565
270,520 *Ans.*

48. The population of New York in 1880 was 5,082,871, and of Ohio 3,198,062. Find the difference.

5,082,871
3,198,062
1,884,809 *Ans.*

49. The population of the United States in 1880 was 50,155,783, in 1870, 38,558,371. Find the increase.

50,155,783
38,558,371
11,597,412 *Ans.*

50. In 1885 the railroads of the United States earned from freight $519,690,992, and from passengers $200,883,911. How much more was earned from freight than from passengers?

$519,690,992
200,883,911
$318,807,081 *Ans.*

51. The imports of raw cotton into England in 1871 were 1,778,139,776 pounds; the exports were 362,075,616 pounds. How many more pounds were imported than exported?

1,778,139,776
362,075,616
1,416,064,160 *Ans.*

Ex. 34. (*Oral.*) Page 49.

1. Of what number are 2 and 4 the factors? 3 and 3? 5 and 3? 2 and 5? 3 and 6? 8, 9, 15, 10, 18.

2. What are the factors of 14? of 9? of 8? of 18? of 6? of 21? of 10? 7, 2; 3, 3; 4, 2; 2, 9 and 3, 6; 3, 2; 7, 3; 5, 2.

3. 4 is one factor of 8; what is the other? 2.
3 is one factor of 12; what is the other? 4.
9 is one factor of 18; what is the other? 2.

4. 3 times what number make 15? 5.
6 times what number make 18? 3.
5 times what number make 25? 5.
4 times what number make 28? 7.
3 times what number make 21? 7.
7 times what number make 14? 2.

5. 8 times what number make 24? 3.
6 times what number make 24? 4.
6 times what number make 12? 42? 30? 18? 2, 7, 5, 3.

6. 7 times what number make 21? 63? 35? 49? 56? 14? 3, 9, 5, 7, 8, 2.

7. 8 times what number make 32? 64? 16? 40? 24? 56? 4, 8, 2, 5, 3, 7.

8. 9 times what number make 27? 72? 45? 63? 36? 18? 3, 8, 5, 7, 4, 2.

9. $6 \times 2 = 12.$
$8 \times 2 = 16.$
$3 \times 2 = 6.$
$9 \times 2 = 18.$
$7 \times 2 = 14.$
$1 \times 2 = 2.$
$0 \times 2 = 0.$
$5 \times 2 = 10.$
$4 \times 2 = 8.$

10. $7 \times 3 = 21.$
$9 \times 3 = 27.$
$0 \times 3 = 0.$
$4 \times 3 = 12.$
$3 \times 8 = 24.$
$3 \times 3 = 9.$
$3 \times 0 = 0.$
$3 \times 5 = 15.$
$3 \times 1 = 3.$

11. $8 \times 4 = 32.$
$1 \times 4 = 4.$
$0 \times 4 = 0.$
$3 \times 4 = 12.$
$9 \times 4 = 36.$
$7 \times 4 = 28.$
$4 \times 4 = 16.$
$6 \times 4 = 24.$
$4 \times 4 = 16.$

12. $0 \times 5 = 0.$
$3 \times 5 = 15.$
$2 \times 5 = 10.$
$7 \times 5 = 35.$
$1 \times 5 = 5.$
$8 \times 5 = 40.$
$6 \times 5 = 30.$
$4 \times 5 = 20.$
$9 \times 5 = 45.$

13. 1 × 6 = 6.
9 × 6 = 54.
8 × 6 = 48.
3 × 6 = 18.
5 × 6 = 30.
0 × 6 = 0.
7 × 6 = 42.
2 × 6 = 12.
4 × 6 = 24.

14. 3 × 7 = 21.
0 × 7 = 0.
1 × 7 = 7.
2 × 7 = 14.
4 × 7 = 28.
8 × 7 = 56.
5 × 7 = 35.
9 × 7 = 63.
6 × 7 = 42.

15. 4 × 8 = 32.
0 × 8 = 0.
3 × 8 = 24.
9 × 8 = 72.
7 × 8 = 56.
1 × 8 = 8.
5 × 8 = 40.
8 × 8 = 64.
8 × 6 = 48.

16. 1 × 9 = 9.
7 × 9 = 63.
0 × 9 = 0.
3 × 9 = 27.
8 × 9 = 72.
6 × 9 = 54.
9 × 9 = 81.
5 × 9 = 45.
9 × 9 = 81.

17. 4 × 6 = 24.
7 × 3 = 21.
9 × 2 = 18.
5 × 3 = 15.
7 × 4 = 28.
8 × 2 = 16.
5 × 7 = 35.
9 × 3 = 27.
4 × 9 = 36.

18. 3 × 2 = 6.
7 × 9 = 63.
8 × 3 = 24.
4 × 5 = 20.
9 × 6 = 54.
7 × 4 = 28.
8 × 9 = 72.
6 × 5 = 30.
7 × 8 = 56.

19. 5 × 2 = 10.
8 × 2 = 16.
6 × 4 = 24.
7 × 3 = 21.
0 × 9 = 0.
7 × 6 = 42.
8 × 5 = 40.
9 × 5 = 45.
3 × 6 = 18.

20. 7 × 4 = 28.
8 × 8 = 64.
0 × 2 = 0.
1 × 9 = 9.
6 × 5 = 30.
7 × 7 = 49.
9 × 9 = 81.
4 × 8 = 32.
7 × 2 = 14.

Ex. 35. Page 51.

1. 4 × 80 = 320.
2. 8 × 40 = 320.
3. 9 × 70 = 630.
4. 7 × 60 = 420.
5. 5 × 60 = 300.
6. 9 × 80 = 720.
7. 6 × 90 = 540.
8. 9 × 40 = 360.
9. 7 × 40 = 280.
10. 5 × 90 = 450.
11. 8 × 50 = 400.
12. 5 × 70 = 350.
13. 6 × 32 = 192.
14. 2 × 62 = 124.
15. 7 × 47 = 329.
16. 3 × 53 = 159.
17. 8 × 54 = 432.
18. 4 × 87 = 348.
19. 9 × 63 = 567.
20. 5 × 96 = 480.
21. 5 × 78 = 390.
22. 6 × 58 = 348.
23. 4 × 86 = 344.
24. 7 × 89 = 623.
25. 3 × 97 = 291.
26. 8 × 57 = 456.
27. 8 × 75 = 600.
28. 9 × 74 = 666.
29. 9 × 28 = 252.
30. 2 × 86 = 172.
31. 2 × 67 = 134.
32. 3 × 95 = 285.
33. 7 × 85 = 595.
34. 4 × 79 = 316.
35. 8 × 74 = 592.
36. 5 × 68 = 340.
37. 9 × 96 = 864.
38. 6 × 59 = 354.
39. 4 × 83 = 332.
40. 7 × 84 = 588.
41. 5 × 94 = 470.
42. 8 × 96 = 768.
43. 8 × 86 = 688.
44. 9 × 78 = 702.
45. 7 × 53 = 371.
46. 8 × 83 = 664.
47. 9 × 68 = 612.
48. 7 × 94 = 658.

Ex. 36. Page 52.

1. $7 \times 800 = 5600$.
2. $4 \times 200 = 800$.
3. $9 \times 700 = 6300$.
4. $5 \times 300 = 1500$.
5. $8 \times 600 = 4800$.
6. $7 \times 400 = 2800$.
7. $6 \times 750 = 4500$.
8. $4 \times 340 = 1360$.
9. $7 \times 960 = 6720$.
10. $6 \times 580 = 3480$.
11. $8 \times 680 = 5440$.
12. $8 \times 630 = 5040$.
13. $6 \times 703 = 4218$.
14. $9 \times 507 = 4563$.
15. $5 \times 809 = 4045$.
16. $7 \times 604 = 4228$.
17. $4 \times 906 = 3624$.
18. $6 \times 803 = 4818$.
19. $2 \times 986 = 1972$.
20. $2 \times 593 = 1186$.
21. $3 \times 593 = 1779$.
22. $3 \times 486 = 1458$.
23. $4 \times 867 = 3468$.
24. $3 \times 837 = 2511$.
25. $5 \times 974 = 4870$.
26. $4 \times 789 = 3156$.
27. $4 \times 947 = 3788$.
28. $5 \times 987 = 4935$.
29. $6 \times 896 = 5376$.
30. $6 \times 456 = 2736$.
31. $7 \times 627 = 4389$.
32. $7 \times 645 = 4515$.
33. $5 \times 865 = 4325$.
34. $8 \times 329 = 2632$.
35. $6 \times 496 = 2976$.
36. $9 \times 584 = 5256$.
37. $8 \times 948 = 7584$.
38. $9 \times 827 = 7443$.
39. $7 \times 825 = 5775$.
40. $8 \times 493 = 3944$.
41. $9 \times 672 = 6048$.
42. $7 \times 756 = 5292$.
43. $8 \times 359 = 2872$.
44. $6 \times 387 = 2322$.
45. $9 \times 865 = 7785$.
46. $5 \times 739 = 3695$.
47. $9 \times 648 = 5832$.
48. $4 \times 867 = 3468$.

Ex. 37. Page 52.

1. $9 \times 6000 = 54{,}000$.
2. $4 \times 8000 = 32{,}000$.
3. $7 \times 8000 = 56{,}000$.
4. $7 \times 9000 = 63{,}000$.
5. $8 \times 6000 = 48{,}000$.
6. $6 \times 7000 = 42{,}000$.
7. $6 \times 7300 = 43{,}800$.
8. $6 \times 7400 = 44{,}400$.
9. $7 \times 8500 = 59{,}500$.
10. $6 \times 8600 = 51{,}600$.
11. $5 \times 3900 = 19{,}500$.
12. $7 \times 7500 = 52{,}500$.
13. $8 \times 6070 = 48{,}560$.
14. $4 \times 9080 = 36{,}320$.
15. $6 \times 5080 = 30{,}480$.
16. $7 \times 4070 = 28{,}490$.
17. $3 \times 7040 = 21{,}120$.
18. $9 \times 3050 = 27{,}450$.
19. $9 \times 6320 = 56{,}880$.
20. $7 \times 3980 = 27{,}860$.
21. $6 \times 8570 = 51{,}420$.
22. $5 \times 7390 = 36{,}950$.
23. $6 \times 8570 = 51{,}420$.
24. $8 \times 6780 = 54{,}240$.
25. $2 \times 6007 = 12{,}014$.
26. $9 \times 7008 = 63{,}072$.
27. $3 \times 8005 = 24{,}015$.
28. $8 \times 4007 = 32{,}056$.
29. $4 \times 6009 = 24{,}036$.
30. $7 \times 5006 = 35{,}042$.
31. $7 \times 8026 = 56{,}182$.
32. $6 \times 7054 = 42{,}324$.
33. $5 \times 9045 = 45{,}225$.
34. $4 \times 6072 = 24{,}288$.
35. $9 \times 6038 = 54{,}342$.
36. $5 \times 5076 = 25{,}380$.

Ex. 38. Page 53.

1. 7204
7
50,428

2. 6305
3
18,915

3. 9308
8
74,464

4. 4706
6
28,236

5. 6407
4
25,628

6. 3809
9
34,281

7. 3628
7
25,396

8. 6984
8
55,872

9. 5746
8
45,968

10. 4968
4
19,872

11. 9786
9
88,074

12. 3715
7
26,005

13. 4716
2
9432

14. 3825
3
11,475

15. 6918
4
27,672

16. 5724
5
28,620

17. 6375
6
38,250

18. 8413
7
58,891

19. 5823
8
46,584

20. 3285
9
29,565

21. 7619
2
15,238

22. 9167
3
27,501

23. 4682
4
18,728

24. 2864
5
14,320

25. 3725
6
22,350

26. 5273
7
36,911

27. 6531
8
52,248

28. 1365
9
12,285

29. 8417
2
16,834

30. 7148
3
21,444

31. 6528
4
26,112

32. 8256
5
41,280

33. 3748
6
22,488

34. 4873
7
34,111

35. 5329
8
42,632

36. 9235
9
83,115

Ex. 39. Page 53.

1.	2739	2739	2739	2739	2739	2739	2739	2739
	2	3	4	5	6	7	8	9
	5478	8217	10,956	13,695	16,434	19,173	21,912	24,651
2.	4519	4519	4519	4519	4519	4519	4519	4519
	2	3	4	5	6	7	8	9
	9038	13,557	18,076	22,595	27,114	31,633	36,152	40,671
3.	8526	8526	8526	8526	8526	8526	8526	8526
	2	3	4	5	6	7	8	9
	17,052	25,578	34,104	42,630	51,156	59,682	68,208	76,734
4.	7658	7658	7658	7658	7658	7658	7658	7658
	2	3	4	5	6	7	8	9
	15,316	22,974	30,632	38,290	45,948	53,606	61,264	68,922
5.	5396	5396	5396	5396	5396	5396	5396	5396
	2	3	4	5	6	7	8	9
	10,792	16,188	21,584	26,980	32,376	37,772	43,168	48,564
6.	5783	5783	5783	5783	5783	5783	5783	5783
	2	3	4	5	6	7	8	9
	11,566	17,349	23,132	28,915	34,698	40,481	46,264	52,047
7.	7463	7463	7463	7463	7463	7463	7463	7463
	2	3	4	5	6	7	8	9
	14,926	22,389	29,852	37,315	44,778	52,241	59,704	67,167
8.	8367	8367	8367	8367	8367	8367	8367	8367
	2	3	4	5	6	7	8	9
	16,734	25,101	33,468	41,835	50,202	58,569	66,936	75,303
9.	8562	8562	8562	8562	8562	8562	8562	8562
	2	3	4	5	6	7	8	9
	17,124	25,686	34,248	42,810	51,372	59,934	68,496	77,058

10.	6483	6483	6483	6483	6483	6483	6483	6483
	2	3	4	5	6	7	8	9
	12,966	19,449	25,932	32,415	38,898	45,381	51,864	58,347

11.	3526	3526	3526	3526	3526	3526	3526	3526
	2	3	4	5	6	7	8	9
	7052	10,578	14,104	17,630	21,156	24,682	28,208	31,734

12.	5417	5417	5417	5417	5417	5417	5417	5417
	2	3	4	5	6	7	8	9
	10,834	16,251	21,668	27,085	32,502	37,919	43,336	48,753

13.	5732	5732	5732	5732	5732	5732	5732	5732
	20	30	40	50	60	70	80	90
	114,640	171,960	229,280	286,600	343,920	401,240	458,560	515,880

14.	6749	6749	6749	6749	6749	6749	6749	6749
	20	30	40	50	60	70	80	90
	134,980	202,470	269,960	337,450	404,940	472,430	539,920	607,410

15.	8345	8345	8345	8345	8345	8345	8345	8345
	20	30	40	50	60	70	80	90
	166,900	250,350	333,800	417,250	500,700	584,150	667,600	751,050

16.	7952	7952	7952	7952	7952	7952	7952	7952
	20	30	40	50	60	70	80	90
	159,040	238,560	318,080	397,600	477,120	556,640	636,160	715,680

17.	6738	6738	6738	6738
	200	300	400	500
	1,347,600	2,021,400	2,695,200	3,369,000
	6738	6738	6738	6738
	600	700	800	900
	4,042,800	4,716,600	5,390,400	6,064,200

18.	3579	3579	3579	3579
	200	300	400	500
	715,800	1,073,700	1,431,600	1,789,500
	3579	3579	3579	3579
	600	700	800	900
	2,147,400	2,505,300	2,863,200	3,221,100
19.	5742	5742	5742	5742
	200	300	400	500
	1,148,400	1,722,600	2,296,800	2,871,000
	5742	5742	5742	5742
	600	700	800	900
	3,445,200	4,019,400	4,593,600	5,167,800
20.	5793	5793	5793	5793
	200	300	400	500
	1,158,600	1,737,900	2,317,200	2,896,500
	5793	5793	5793	5793
	600	700	800	900
	3,475,800	4,055,100	4,634,400	5,213,700
21.	4827	4827	4827	4827
	2000	3000	4000	5000
	9,654,000	14,481,000	19,308,000	24,135,000
	4827	4827	4827	4827
	6000	7000	8000	9000
	28,962,000	33,789,000	38,616,000	43,443,000
22.	9357	9357	9357	9357
	2000	3000	4000	5000
	18,714,000	28,071,000	37,428,000	46,785,000
	9357	9357	9357	9357
	6000	7000	8000	9000
	56,142,000	65,499,000	74,856,000	84,213,000

23.

$$\begin{array}{rrrr} 6519 & 6519 & 6519 & 6519 \\ 2000 & 3000 & 4000 & 5000 \\ \hline 13{,}038{,}000 & 19{,}557{,}000 & 26{,}076{,}000 & 32{,}595{,}000 \end{array}$$

$$\begin{array}{rrrr} 6519 & 6519 & 6519 & 6519 \\ 6000 & 7000 & 8000 & 9000 \\ \hline 39{,}114{,}000 & 45{,}633{,}000 & 52{,}152{,}000 & 58{,}671{,}000 \end{array}$$

24.

$$\begin{array}{rrrr} 7953 & 7953 & 7953 & 7953 \\ 2000 & 3000 & 4000 & 5000 \\ \hline 15{,}906{,}000 & 23{,}859{,}000 & 31{,}812{,}000 & 39{,}765{,}000 \end{array}$$

$$\begin{array}{rrrr} 7953 & 7953 & 7953 & 7953 \\ 6000 & 7000 & 8000 & 9000 \\ \hline 47{,}718{,}000 & 55{,}671{,}000 & 63{,}624{,}000 & 71{,}577{,}000 \end{array}$$

Ex. 40. Page 55.

1.

$$\begin{array}{r} 8436 \\ 27 \\ \hline 59052 \\ 16872 \\ \hline 227{,}772 \end{array}$$

2.

$$\begin{array}{r} 7358 \\ 26 \\ \hline 44148 \\ 14716 \\ \hline 191{,}308 \end{array}$$

3.

$$\begin{array}{r} 3579 \\ 36 \\ \hline 21474 \\ 10737 \\ \hline 128{,}844 \end{array}$$

4.

$$\begin{array}{r} 5684 \\ 37 \\ \hline 39788 \\ 17052 \\ \hline 210{,}308 \end{array}$$

5.

$$\begin{array}{r} 5823 \\ 45 \\ \hline 29115 \\ 23292 \\ \hline 262{,}035 \end{array}$$

6.

$$\begin{array}{r} 4263 \\ 43 \\ \hline 12789 \\ 17052 \\ \hline 183{,}309 \end{array}$$

7.

$$\begin{array}{r} 4271 \\ 53 \\ \hline 12813 \\ 21355 \\ \hline 226{,}363 \end{array}$$

8.

$$\begin{array}{r} 7538 \\ 54 \\ \hline 30152 \\ 37690 \\ \hline 407{,}052 \end{array}$$

9.

$$\begin{array}{r} 9057 \\ 64 \\ \hline 36228 \\ 54342 \\ \hline 579{,}648 \end{array}$$

10. 8154
65
40770
48924
530,010

11. 6381
78
51048
44667
497,718

12. 9472
74
37888
66304
700,928

13. 8495
83
25485
67960
705,085

14. 5283
86
31698
42264
454,338

15. 5246
91
5246
47214
477,386

16. 6475
93
19425
58275
602,175

17. 8167
26
49002
16334
212,342

18. 7384
29
66456
14768
214,136

19. 7496
38
59968
22488
284,848

20. 4976
34
19904
14928
169,184

21. 4982
47
34874
19928
234,154

22. 8217
46
49302
32868
377,982

23. 6284
56
37704
31420
351,904

24. 9582
57
67074
47910
546,174

Ex. 41. Page 55.

1.
6492
364
25968
38952
19476
2,363,088 *Ans.*

2.
4756
327
33292
9512
14268
1,555,212 *Ans.*

3.
5718
283
17154
45744
11436
1,618,194 *Ans.*

4.
3862
465
19310
23172
15448
1,795,830 *Ans.*

5.
4718
592
9436
42462
23590
2,793,056 *Ans.*

6.
5926
583
17778
47408
29630
3,454,858 *Ans.*

7.
8529
647
59703
34116
51174
5,518,263 *Ans.*

8.
6548
637
45836
19644
39288
4,171,076 *Ans.*

9.
9438
741
9438
37752
66066
6,993,558 *Ans.*

10.
4857
758
38856
24285
33999
3,681,606 *Ans.*

11.
3741
824
14964
7482
29928
3,082,584 *Ans.*

12.
3297
826
19782
6594
26376
2,723,322 *Ans.*

13.
6527
843
19581
26108
52216
5,502,261 *Ans.*

14.
5729
935
28645
17187
51561
5,356,615 *Ans.*

15.
7186
297
50302
64674
14372
2,134,242 *Ans.*

16.
8526
487
59682
68208
34104
4,152,162 *Ans.*

17.
3849
752
7698
19245
26943
2,894,448 *Ans.*

18.
6392
594
25568
57528
31960
3,796,848 *Ans.*

19.
6973
265
34865
41838
13946
1,847,845 *Ans.*

20.
7495
378
59960
52465
22485
2,833,110 *Ans.*

21.
8247
374
32988
57729
24741
3,084,378 *Ans.*

22.
9238
648
73904
36952
55428
5,986,224 *Ans.*

23.
9753
864
39012
58518
78024
8,426,592 *Ans.*

24.
5937
798
47496
53433
41559
4,737,726 *Ans.*

Ex. 42. Page 56.

1. What will 29 acres of land cost at $475 an acre?

$475
29
4275
950
$13,775 *Ans.*

2. What will 89 passenger cars cost at $3785 each?

$3785
89
34065
30280
$336,865 *Ans.*

3. A square mile contains 640 acres. How many acres in a county containing 936 square miles?

640
936
3840
192
576
599,040 *Ans.*

4. If a cotton factory makes 9360 yards of cloth daily, how many yards will the factory make in a year (313 days)?

```
     9360
      313
    -----
    28080
    936
   2808
---------
2,929,680 Ans.
```

5. The cost of building a certain road was, on the average, $1789 a mile. What was the cost of 327 miles of the road?

```
    $1789
      327
    -----
    12523
    3578
   5367
---------
 $585,003 Ans.
```

6. If a field contains 2340 hills of potatoes, and the average number of potatoes in a hill is 12, how many potatoes are there in the field?

```
  2340*
    12
  ----
  4680
  234
------
28,080 Ans.
```

* Multiplier and multiplicand are here interchanged for convenience.

7. If a saw mill turns out 5708 feet of boards in a day, how many feet will it turn out in 294 days?

```
     5708
      294
    -----
    22832
   51372
  11416
---------
1,678,152 Ans.
```

8. A pound of platinum is worth $85. If 4730 pounds are obtained yearly from South America and the Ural Mountains, what is the value of the whole amount?

```
    4730
      85
   -----
   23650
  37840
--------
$402,050 Ans.
```

9. Two cities 294 miles apart are to be connected by a railroad, at a cost of $24,645 per mile. What will be the cost of the road?

```
    $24645
       294
    ------
     98580
   221805
   49290
----------
$7,245,630 Ans
```

10. If 125 tons of steel rails are required for one mile of railroad, how many tons will be necessary for 389 miles?

```
   125
   389
  ----
  1125
 1000
 375
------
48,625 Ans.
```

11. A mile contains 5280 feet. How many feet in 542 miles?

542
5280
43360
1084
2710
2,861,760 *Ans.*

12. The garrison of a fort consumes 785 pounds of bread a day. How many pounds will be consumed in 3 years of 365 days?

3 × 365 = 1095.

1095
785
5475
8760
7665
859,575 *Ans.*

13. If a railway train runs 38 miles in an hour, how many miles will it run in 84 trips of 3 hours each?

3 × 38 = 114.

114
84
456
912
9576 *Ans.*

14. A square mile contains 640 acres. How many acres are there in 3481 square miles?

3481
640
139240
20886
2,227,840 *Ans.*

15. At the rate of 1275 words in an hour, how many words can be sent over a telegraph line in 108 hours?

1275
108
10200
1275
137,700 *Ans.*

16. A clock strikes 156 times a day. How many times does it strike in a leap year, 366 days?

156
366
936
936
468
57,096 *Ans.*

17. If a swallow destroys daily 500 insects, how many will it destroy in 92 days?

92
500
46,000 *Ans.*

18. At 27 bushels an acre, how many bushels of wheat will be harvested from 640 acres?

$$\begin{array}{r} 27 \\ 640 \\ \hline 1080 \\ 162 \\ \hline 17{,}280 \end{array}$$ *Ans.*

19. A good cow yields 168 pounds of butter a year. If it takes 215,000 cows to supply London with butter, how many pounds of butter are consumed in that city annually?

$$\begin{array}{r} 168 \\ 215000 \\ \hline 840000 \\ 168 \\ 336 \\ \hline 36{,}120{,}000 \end{array}$$ *Ans.*

20. If sound travels at the rate of 1120 feet in a second, how many feet distant is a cloud where the thunder clap follows the flash of lightning in 9 seconds?

$$\begin{array}{r} 1120 \\ 9 \\ \hline 10{,}080 \end{array}$$ *Ans.*

21. Find the weight in pounds of 5792 iron bars, each weighing 24 pounds.

$$\begin{array}{r} 5792 \\ 24 \\ \hline 23168 \\ 11584 \\ \hline 139{,}008 \end{array}$$ *Ans.*

22. From what number can 847 be subtracted 307 times, and leave a remainder of 49?

$$\begin{array}{r} 847 \\ 307 \\ \hline 5929 \\ 2541 \\ \hline 260{,}029 \\ 49 \\ \hline 260{,}078 \end{array}$$ *Ans.*

23. If 19 men can do a piece of work in 31 days, how many days will it take one man to do it?

$$\begin{array}{r} 31 \\ 19 \\ \hline 279 \\ 31 \\ \hline 589 \end{array}$$ *Ans.*

24. If an army consists of 24 regiments averaging 913 men each, how many men are there in the whole army?

$$\begin{array}{r} 913 \\ 24 \\ \hline 3652 \\ 1826 \\ \hline 21{,}912 \end{array}$$ *Ans.*

25. If one acre produces 211 pounds of cotton, how many pounds will 933,000 acres produce?

$$\begin{array}{r} 211 \\ 933000 \\ \hline 633000 \\ 633 \\ 1899 \\ \hline 196{,}863{,}000 \end{array}$$ *Ans.*

26. If one acre produces 154 pounds of tobacco, how many pounds will 10,070 acres produce?

$$\begin{array}{r} 154\\ 10070\\ \hline 10780\\ 154\\ \hline 1{,}550{,}780 \end{array}\ \textit{Ans.}$$

27. If one acre produces 28 bushels of oats, how many bushels will 911,200 acres produce?

$$\begin{array}{r} 911200\\ 28\\ \hline 7289600\\ 18224\\ \hline 25{,}513{,}600 \end{array}\ \textit{Ans.}$$

28. If one acre produces 42 bushels of corn, how many bushels will 201,106 acres produce?

$$\begin{array}{r} 201106\\ 42\\ \hline 402212\\ 804424\\ \hline 8{,}446{,}452 \end{array}\ \textit{Ans.}$$

29. If one acre produces 17 bushels of wheat, how many bushels will 613,263 acres produce?

$$\begin{array}{r} 613263\\ 17\\ \hline 4292841\\ 613263\\ \hline 10{,}425{,}471 \end{array}\ \textit{Ans.}$$

30. If one acre produces 227 bushels of potatoes, how many bushels will 19,121 acres produce?

$$\begin{array}{r} 19121\\ 227\\ \hline 133847\\ 38242\\ 38242\\ \hline 4{,}340{,}467 \end{array}\ \textit{Ans.}$$

31. If one acre produces 23 bushels of barley, how many bushels will 237,769 acres produce?

$$\begin{array}{r} 237769\\ 23\\ \hline 713307\\ 475538\\ \hline 5{,}468{,}687 \end{array}\ \textit{Ans.}$$

32. If one acre produces 19 bushels of winter rye, how many bushels will 27,119 acres produce?

$$\begin{array}{r} 27119\\ 19\\ \hline 244071\\ 27119\\ \hline 515{,}261 \end{array}\ \textit{Ans.}$$

33. British India has a population of 150 to the square mile, and contains 1,004,616 square miles. Find its population.

$$\begin{array}{r} 1004616\\ 150\\ \hline 50230800\\ 1004616\\ \hline 150{,}692{,}400 \end{array}\ \textit{Ans.}$$

Ex. 43. (*Oral.*) Page 59.

$2 \times 8 = 16. \quad \therefore 16 \div 2 = 8.$

$16 \div 8 = 2.$

$2 \times 2 = 4. \quad \therefore 4 \div 2 = 2.$

$2 \times 5 = 10. \quad \therefore 10 \div 2 = 5.$

$10 \div 5 = 2.$

$2 \times 9 = 18. \quad \therefore 18 \div 2 = 9.$

$18 \div 9 = 2.$

$3 \times 4 = 12. \quad \therefore 12 \div 4 = 3.$

$12 \div 3 = 4.$

$3 \times 3 = 9. \quad \therefore 9 \div 3 = 3.$

$3 \times 6 = 18. \quad \therefore 18 \div 6 = 3.$

$18 \div 3 = 6.$

$3 \times 9 = 27. \quad \therefore 27 \div 9 = 3.$

$27 \div 3 = 9.$

$3 \times 7 = 21. \quad \therefore 21 \div 3 = 7.$

$21 \div 7 = 3.$

$3 \times 8 = 24. \quad \therefore 24 \div 8 = 3.$

$24 \div 3 = 8.$

$3 \times 5 = 15. \quad \therefore 15 \div 5 = 3.$

$15 \div 3 = 5.$

$4 \times 5 = 20. \quad \therefore 20 \div 4 = 5.$

$20 \div 5 = 4.$

$4 \times 3 = 12. \quad \therefore 12 \div 4 = 3.$

$12 \div 3 = 4.$

$4 \times 6 = 24. \quad \therefore 24 \div 6 = 4.$

$24 \div 4 = 6.$

$4 \times 9 = 36. \quad \therefore 36 \div 9 = 4.$

$36 \div 4 = 9.$

$2 \times 6 = 12. \quad \therefore 12 \div 6 = 2.$

$12 \div 2 = 6.$

$2 \times 3 = 6. \quad \therefore 6 \div 3 = 2.$

$6 \div 2 = 3.$

$2 \times 7 = 14. \quad \therefore 14 \div 7 = 2.$

$14 \div 2 = 7.$

$5 \times 9 = 45. \quad \therefore 45 \div 5 = 9.$

$45 \div 9 = 5.$

$5 \times 8 = 40. \quad \therefore 40 \div 8 = 5.$

$40 \div 5 = 8.$

$5 \times 3 = 15. \quad \therefore 15 \div 3 = 5.$

$15 \div 5 = 3.$

$5 \times 6 = 30. \quad \therefore 30 \div 6 = 5.$

$30 \div 5 = 6.$

$5 \times 4 = 20. \quad \therefore 20 \div 4 = 5.$

$20 \div 5 = 4.$

$5 \times 7 = 35. \quad \therefore 35 \div 7 = 5.$

$35 \div 5 = 7.$

$6 \times 9 = 54. \quad \therefore 54 \div 6 = 9.$

$54 \div 9 = 6.$

$6 \times 3 = 18. \quad \therefore 18 \div 6 = 3.$

$18 \div 3 = 6.$

$6 \times 6 = 36 \quad \therefore 36 \div 6 = 6.$

$6 \times 7 = 42. \quad \therefore 42 \div 6 = 7.$

$42 \div 7 = 6.$

$6 \times 8 = 48. \quad \therefore 48 \div 8 = 6.$

$48 \div 6 = 8.$

$6 \times 5 = 30. \quad \therefore 30 \div 6 = 5.$

$30 \div 5 = 6.$

$4 \times 7 = 28.$ $\therefore 28 \div 7 = 4.$
$28 \div 4 = 7.$
$4 \times 8 = 32.$ $\therefore 32 \div 4 = 8.$
$32 \div 8 = 4.$
$4 \times 4 = 16.$ $\therefore 16 \div 4 = 4.$

$5 \times 5 = 25.$ $\therefore 25 \div 5 = 5.$
$7 \times 4 = 28.$ $\therefore 28 \div 4 = 7.$
$28 \div 7 = 4.$
$7 \times 8 = 56.$ $\therefore 56 \div 7 = 8.$
$56 \div 8 = 7.$
$7 \times 5 = 35.$ $\therefore 35 \div 7 = 5.$
$35 \div 5 = 7.$
$7 \times 6 = 42.$ $\therefore 42 \div 6 = 7.$
$42 \div 7 = 6.$
$8 \times 8 = 64.$ $\therefore 64 \div 8 = 8.$
$8 \times 3 = 24.$ $\therefore 24 \div 8 = 3.$
$24 \div 3 = 8.$
$8 \times 7 = 56.$ $\therefore 56 \div 7 = 8.$
$56 \div 8 = 7.$
$8 \times 5 = 40.$ $\therefore 40 \div 5 = 8.$
$40 \div 8 = 5.$

$6 \times 4 = 24.$ $\therefore 24 \div 6 = 4.$
$24 \div 4 = 6.$
$7 \times 3 = 21.$ $\therefore 21 \div 3 = 7.$
$21 \div 7 = 3.$
$7 \times 9 = 63.$ $\therefore 63 \div 9 = 7.$
$63 \div 7 = 9.$
$7 \times 7 = 49.$ $\therefore 49 \div 7 = 7.$
$8 \times 9 = 72.$ $\therefore 72 \div 9 = 8.$
$72 \div 8 = 9.$
$8 \times 4 = 32.$ $\therefore 32 \div 4 = 8.$
$32 \div 8 = 4.$
$9 \times 3 = 27.$ $\therefore 27 \div 9 = 3.$
$27 \div 3 = 9.$
$9 \times 5 = 45.$ $\therefore 45 \div 9 = 5.$
$45 \div 5 = 9.$
$9 \times 9 = 81.$ $\therefore 81 \div 9 = 9.$
$9 \times 6 = 54.$ $\therefore 54 \div 9 = 6.$
$54 \div 6 = 9.$
$9 \times 8 = 72.$ $\therefore 72 \div 8 = 9.$
$72 \div 9 = 8.$
$9 \times 7 = 63.$ $\therefore 63 \div 9 = 7.$
$63 \div 7 = 9.$

Ex. 44. (*Oral.*) Page 61.

1.

6)	54	18	42	12	6	24	36	60	30	48
	9	3	7	2	1	4	6	10	5	8

2.

4)	28	16	20	32	40	36	4	24	12	8
	7	4	5	8	10	9	1	6	3	2

3.

8)	32	48	64	16	40	24	56	8	72	0
	4	6	8	2	5	3	7	1	9	0

4.

9)	0	27	72	81	18	63	54	9	45	36
	0	3	8	9	2	7	6	1	5	4

5.	7)21	0	14	7	28	42	35	56	63	49
	3	0	2	1	4	6	5	8	9	7

6.	5)30	45	20	5	40	50	25	15	35	10
	6	9	4	1	8	10	5	3	7	2

7.	3) 9	12	3	30	27	18	15	21	6	24
	3	4	1	10	9	6	5	7	2	8

Ex. 45. (*Oral.*) Page 62.

1.	2)11	7	9	15	13	14	18	19	16	17
	5-1	3-1	4-1	7-1	6-1	7	9	9-1	8	8-1

2.	3) 7	11	10	13	16	14	17	15	5	19
	2-1	3-2	3-1	4-1	5-1	4-2	5-2	5	1-2	6-1

3.	4)19	7	13	17	25	15	22	31	33	29
	4-3	1-3	3-1	4-1	6-1	3-3	5-2	7-3	8-1	7-1

4.	9)71	83	15	25	34	17	19	62	26	44
	7-8	9-2	1-6	2-7	3-7	1-8	2-1	6-8	2-8	4-8

5.	7)15	19	27	38	40	54	48	60	17	39
	2-1	2-5	3-6	5-3	5-5	7-5	6-6	8-4	2-3	5-4

6.	8)23	14	31	17	9	25	37	68	71	28
	2-7	1-6	3-7	2-1	1-1	3-1	4-5	8-4	8-7	3-4

7.	6)20	15	19	27	32	10	13	45	57	40
	3-2	2-3	3-1	4-3	5-2	1-4	2-1	7-3	9-3	6-4

8.	5)14	9	13	21	43	12	49	32	29	38
	2-4	1-4	2-3	4-1	8-3	2-2	9-4	6-2	5-4	7-3

9.	7)11	18	26	37	34	53	47	59	16	33
	1-4	2-4	3-5	5-2	4-6	7-4	6-5	8-3	2-2	4-5

10.	5)13	11	22	16	42	32	48	31	49	37
	2-3	2-1	4-2	3-1	8-2	6-2	9-3	6-1	9-4	7-2

11.	6)21	16	31	19	11	26	39	46	56	41
	3-3	2-4	5-1	3-1	1-5	4-2	6-3	7-4	9-2	6-5
12.	8)33	34	39	18	27	41	69	70	75	63
	4-1	4-2	4-7	2-2	3-3	5-1	8-5	8-6	9-3	7-7
13.	9)73	16	84	29	35	43	51	64	80	70
	8-1	1-7	9-3	3-2	3-8	4-7	5-6	7-1	8-8	7-7
14.	5)37	41	34	27	36	23	28	33	44	48
	7-2	8-1	6-4	5-2	7-1	4-3	5-3	6-3	8-4	9-3
15.	6)37	44	17	10	51	58	25	34	59	50
	6-1	7-2	2-5	1-4	8-3	9-4	4-1	5-4	9-5	8-2
16.	8)26	39	30	42	53	20	36	43	51	57
	3-2	4-7	3-6	5-2	6-5	2-4	4-4	5-3	6-3	7-1
17.	9)21	37	23	41	47	11	55	50	60	65
	2-3	4-1	2-5	4-5	5-2	1-2	6-1	5-5	6-6	7-2
18.	7)13	23	61	46	55	69	25	58	62	18
	1-6	3-2	8-5	6-4	7-6	9-6	3-4	8-2	8-6	2-4
19.	8)55	67	73	44	61	50	74	65	52	77
	6-7	8-3	9-1	5-4	7-5	6-2	9-2	8-1	6-4	9-5

Ex. 46. Page 65.

1. 48 ÷ 2 = 24.
2. 72 ÷ 3 = 24.
3. 56 ÷ 4 = 14.
4. 85 ÷ 5 = 17.
5. 96 ÷ 6 = 16.
6. 84 ÷ 7 = 12.
7. 96 ÷ 8 = 12.
8. 99 ÷ 9 = 11.
9. 90 ÷ 6 = 15.
10. 75 ÷ 5 = 15.
11. 98 ÷ 7 = 14.
12. 92 ÷ 4 = 23.
13. 57 ÷ 2 = 28-1.
14. 83 ÷ 3 = 27-2.
15. 75 ÷ 4 = 18-3.
16. 48 ÷ 5 = 9-3.
17. 77 ÷ 6 = 12-5.
18. 82 ÷ 7 = 11-5.
19. 91 ÷ 8 = 11-3.
20. 94 ÷ 9 = 10-4.
21. 94 ÷ 5 = 18-4.
22. 87 ÷ 4 = 21-3.
23. 95 ÷ 6 = 15-5.
24. 77 ÷ 3 = 25-2.
25. 734 ÷ 2 = 367.
26. 768 ÷ 3 = 256.
27. 956 ÷ 4 = 239.

28. 815 ÷ 5 = 163.
29. 714 ÷ 6 = 119.
30. 826 ÷ 7 = 118.
31. 952 ÷ 8 = 119.
32. 972 ÷ 9 = 108.
33. 912 ÷ 8 = 114.
34. 492 ÷ 4 = 123.
35. 675 ÷ 5 = 135.
36. 918 ÷ 6 = 153.
37. 513 ÷ 2 = 256-1.
38. 719 ÷ 3 = 239-2.
39. 623 ÷ 4 = 155-3.
40. 749 ÷ 5 = 149-4.
41. 875 ÷ 6 = 145-5.
42. 643 ÷ 7 = 91-6.
43. 927 ÷ 8 = 115-7.
44. 705 ÷ 9 = 78-3.
45. 591 ÷ 8 = 73-7.
46. 853 ÷ 7 = 121-6.
47. 735 ÷ 6 = 122-3.
48. 923 ÷ 5 = 184-3.
49. 7594 ÷ 2 = 3797.
50. 7458 ÷ 3 = 2486.
51. 9656 ÷ 4 = 2414.
52. 7985 ÷ 5 = 1597.
53. 9354 ÷ 6 = 1559.
54. 8176 ÷ 7 = 1168.
55. 9456 ÷ 8 = 1182.
56. 8568 ÷ 9 = 952.
57. 3712 ÷ 8 = 464.
58. 2226 ÷ 7 = 318.
59. 2550 ÷ 6 = 425.
60. 2895 ÷ 5 = 579.
61. 5391 ÷ 2 = 2695-1.
62. 7418 ÷ 3 = 2472-2.
63. 5327 ÷ 4 = 1331-3.
64. 8236 ÷ 5 = 1647-1.
65. 7129 ÷ 6 = 1188-1.
66. 8513 ÷ 7 = 1216-1.
67. 9237 ÷ 8 = 1154-5.
68. 5682 ÷ 9 = 631-3.
69. 4017 ÷ 7 = 573-6.
70. 7139 ÷ 8 = 892-3.
71. 9415 ÷ 6 = 1569-1.
72. 8793 ÷ 5 = 1758-3.
73. 3794 ÷ 2 = 1897.
74. 7929 ÷ 3 = 2643.
75. 6728 ÷ 4 = 1682.
76. 6380 ÷ 5 = 1276.
77. 8322 ÷ 6 = 1387.
78. 9219 ÷ 7 = 1317.
79. 7395 ÷ 2 = 3697-1.
80. 7684 ÷ 3 = 2561-1.
81. 7315 ÷ 4 = 1828-3.
82. 8369 ÷ 5 = 1673-4.
83. 5869 ÷ 6 = 978-1.
84. 4239 ÷ 7 = 605-4.

85.	2)5794 2897	3)5794 1931-1	4)5794 1448-2	5)5794 1158-4
	6)5794 965-4	7)5794 827-5	8)5794 724-2	9)5794 643-7
86.	2)4572 2286	3)4572 1524	4)4572 1143	5)4572 914-2
	6)4572 762	7)4572 653-1	8)4572 571-4	9)4572 508
87.	2)9785 4892-1	3)9785 3261-2	4)9785 2446-1	5)9785 1957
	6)9785 1630-5	7)9785 1397-6	8)9785 1223-1	9)9785 1087-2

88.	2)7163 3581-1	3)7163 2387-2	4)7163 1790-3	5)7163 1432-3
	6)7163 1193-5	7)7163 1023-2	8)7163 895-3	9)7163 795-8
89.	$2\cancel{0})823\cancel{9}$ 411-19	$3\cancel{0})823\cancel{9}$ 274-19	$4\cancel{0})823\cancel{9}$ 205-39	$5\cancel{0})823\cancel{9}$ 164-39
	$6\cancel{0})823\cancel{9}$ 137-19	$7\cancel{0})823\cancel{9}$ 117-49	$8\cancel{0})823\cancel{9}$ 102-79	$9\cancel{0})823\cancel{9}$ 91-49
90.	$2\cancel{0})519\cancel{7}$ 259-17	$3\cancel{0})519\cancel{7}$ 173-7	$4\cancel{0})519\cancel{7}$ 129-37	$5\cancel{0})519\cancel{7}$ 103-47
	$6\cancel{0})519\cancel{7}$ 86-37	$7\cancel{0})519\cancel{7}$ 74-17	$8\cancel{0})519\cancel{7}$ 64-77	$9\cancel{0})519\cancel{7}$ 57-67
91.	$2\cancel{0})327\cancel{4}$ 163-14	$3\cancel{0})327\cancel{4}$ 109-4	$4\cancel{0})327\cancel{4}$ 81-34	$5\cancel{0})327\cancel{4}$ 65-24
	$6\cancel{0})327\cancel{4}$ 54-34	$7\cancel{0})327\cancel{4}$ 46-54	$80)327\cancel{4}$ 40-74	$9\cancel{0})327\cancel{4}$ 36-34
92.	$2\cancel{0})583\cancel{4}$ 291-14	$3\cancel{0})583\cancel{4}$ 194-14	$4\cancel{0})583\cancel{4}$ 145-34	$5\cancel{0})583\cancel{4}$ 116-34
	$60)583\cancel{4}$ 97-14	$7\cancel{0})583\cancel{4}$ 83-24	$8\cancel{0})583\cancel{4}$ 72-74	$9\cancel{0})5834$ 64-74
93.	$2\cancel{0}\cancel{0})45\cancel{7}\cancel{1}$ 22-171	$3\cancel{0}\cancel{0})45\cancel{7}\cancel{1}$ 15-71	$4\cancel{0}\cancel{0})45\cancel{7}\cancel{1}$ 11-171	$5\cancel{0}\cancel{0})45\cancel{7}\cancel{1}$ 9-71
	$6\cancel{0}\cancel{0})457\cancel{1}$ 7-371	$7\cancel{0}\cancel{0})45\cancel{7}\cancel{1}$ 6-371	$8\cancel{0}\cancel{0})4571$ 5-571	$9\cancel{0}\cancel{0})45\cancel{7}\cancel{1}$ 5-71
94.	$2\cancel{0}\cancel{0})57\cancel{6}\cancel{8}$ 28-168	$3\cancel{0}\cancel{0})57\cancel{6}\cancel{8}$ 19-68	$4\cancel{0}\cancel{0})57\cancel{6}\cancel{8}$ 14-168	$5\cancel{0}\cancel{0})57\cancel{6}\cancel{8}$ 11-268
	$6\cancel{0}\cancel{0})57\cancel{6}\cancel{8}$ 9-368	$7\cancel{0}\cancel{0})57\cancel{6}\cancel{8}$ 8-168	$8\cancel{0}\cancel{0})57\cancel{6}\cancel{8}$ 7-168	$9\cancel{0}\cancel{0})57\cancel{6}\cancel{8}$ 6-368

95.

$\underline{2\cancel{0}\cancel{0})95\cancel{6}\cancel{3}}$ 47-163 | $\underline{3\cancel{0}\cancel{0})95\cancel{6}\cancel{3}}$ 31-263 | $\underline{4\cancel{0}\cancel{0})95\cancel{6}\cancel{3}}$ 23-363 | $\underline{5\cancel{0}\cancel{0})95\cancel{6}\cancel{3}}$ 19-63

$\underline{6\cancel{0}\cancel{0})95\cancel{6}\cancel{3}}$ 15-563 | $\underline{7\cancel{0}\cancel{0})95\cancel{6}\cancel{3}}$ 13-463 | $\underline{8\cancel{0}\cancel{0})95\cancel{6}\cancel{3}}$ 11-763 | $\underline{9\cancel{0}\cancel{0})95\cancel{6}\cancel{3}}$ 10-563

96.

$\underline{2\cancel{0}\cancel{0})98\cancel{7}\cancel{6}}$ 49-76 | $\underline{3\cancel{0}\cancel{0})98\cancel{7}\cancel{6}}$ 32-276 | $\underline{4\cancel{0}\cancel{0})98\cancel{7}\cancel{6}}$ 24-276 | $\underline{5\cancel{0}\cancel{0})98\cancel{7}\cancel{6}}$ 19-376

$\underline{6\cancel{0}\cancel{0})98\cancel{7}\cancel{6}}$ 16-276 | $\underline{7\cancel{0}\cancel{0})98\cancel{7}\cancel{6}}$ 14-76 | $\underline{8\cancel{0}\cancel{0})98\cancel{7}\cancel{6}}$ 12-276 | $\underline{9\cancel{0}\cancel{0})98\cancel{7}\cancel{6}}$ 10-876

Ex. 47. Page 66.

1. There were 72 children in a Sunday-school, and they walked two and two to church. How many rows would they make? How many rows would there have been if they had walked three and three?

$\underline{2)72}$ $\underline{3)72}$
36 (1) *Ans.* 24 (2) *Ans.*

2. A boy had 97 filberts. He kept 34 for himself, and divided the rest equally among his 9 classmates. How many did he give to each?

97
$\underline{34}$
$\underline{9)63}$
7 *Ans.*

3. How many times must we take the number 7 to make 819? How many times the number 9?

$\underline{7)819}$ $\underline{9)819}$
117 (1) *Ans.* 91 (2) *Ans.*

4. Divide a paper of 264 pins equally into 8 papers.

$\underline{8)264}$
33 *Ans.*

5. 2691 poles were used in a certain hop-yard, and 3 were required for each plant. How many plants were there?

$\underline{3)2691}$
897 *Ans.*

6. A blacksmith uses 7 nails in putting on one shoe, and in one day he used 336 nails. How many hoofs did he shoe?

$\underline{7)336}$
48 *Ans.*

7. A forest of 1995 trees is to be thinned by cutting down 1 tree in 7. How many will be taken out?

$\underline{7)1995}$
285 *Ans.*

8. A regiment consists of 1200 men and 60 officers. How many men are there to each officer?

$6\cancel{0})\underline{120\cancel{0}}$
20 *Ans.*

9. When beef is $7 per hundred-weight, how many hundred-weight can be bought for $9,700,327?

$7)\underline{9700327}$
1,385,761 *Ans.*

10. How many tons of coal, at $9, can be bought for $3,596,301?

$9)\underline{3596301}$
399,589 *Ans.*

11. A wagon travels 58,068 feet. How many times will a wheel 12 feet in circumference turn in going that distance?

$12)\underline{58068}$
4839 *Ans.*

12. A square yard contains 9 square feet. How many square yards in 3,917,502 square feet?

$9)\underline{3917502}$
435,278 *Ans.*

13. Aaron Reed left $325,645 for his wife and four children. How much had each, if the property was divided equally among them?

$5)\underline{\$325645}$
$65,129 *Ans.*

14. A grocer sells brown sugar at $9 per hundred-weight. If he receives $976,482, how many hundred-weight does he sell?

$9)\underline{976482}$
108,498 *Ans.*

15. John Brown paid $375,008 for a tract of wild land, at $8 per acre. How many acres did he buy?

$8)\underline{375008}$
46,876 *Ans.*

16. How many tons of coal, at $7 per ton, can be purchased for $3,785,908?

$7)\underline{3785908}$
540,844 *Ans.*

17. A merchant received $397,640 in selling a quantity of flour, at $8 per barrel. How many barrels did he sell?

$8)\underline{397640}$
49,705 *Ans.*

19. A drover paid $20 for 5 sheep. What will be the cost of 125 sheep?

$5)\underline{\$20}$
$4

125
$\underline{\$4}$
$500 *Ans.*

20. Three cows cost $156. What must be paid for 27 cows?

$3)\underline{\$156}$
$52

$52
$\underline{27}$
364
$\underline{104}$
$1404 *Ans.*

21. If 7 tons of hay cost $105, what will be the cost of 63 tons?

7)$105
$15

$15
63
45
90
$945 *Ans.*

22. If 9 barrels of flour are worth $63, how many barrels of apples, at $3 a barrel, will pay for 72 barrels of flour?

9)$63
$7, cost of 1 bbl. of flour.
72
3)$504, cost of 72 bbls. of flour.
168 *Ans.*

23. If 7 cords of birch wood are worth $28, how many cords of birch will pay for 6 barrels of sugar worth $16 a barrel?

7)28
4, worth of 1 cord.
16
6
4)96, cost of 6 bbls. sugar.
24 *Ans.*

24. If 12 men do a piece of work in 12 hours, how many hours would it take 8 men to do the same work?

12
12
8)144, time 1 man would take.
18 *Ans.*

Ex. 48. Page 70.

1.
208
21)4386
42
186
168
18

2.
170
31)5271
31
217
217
1

3.
196
41)8056
41
395
369
266
246
20

4.
140
51)7158
51
205
204
18

153
61)9357
61
325
305
207
183
24

6.
74
71)5263
497
293
284
9

37
7. 82)3046
246
586
574
12

78
8. 92)7219
644
779
736
43

317
9. 22)6985
66
38
22
165
154
11

308
10. 32)9876
96
276
256
20

56
11. 42)2378
210
278
252
26

78
12. 52)4068
364
428
416
12

132
13. 63)8359
63
205
189
169
126
43

62
14. 73)4573
438
193
146
47

87
15. 84)7358
672
638
588
50

42
16. 94)3985
376
225
188
37

278
17. 25)6973
50
197
175
223
200
23

205
18. 36)7413
72
213
180
33

186
19. 47)8765
47
406
376
305
282
23

134
20. 57)7654
57
195
171
244
228
16

21.
$$\begin{array}{r} 96 \\ 68\overline{)6543} \\ \underline{612} \\ 423 \\ \underline{408} \\ 15 \end{array}$$

22.
$$\begin{array}{r} 106 \\ 78\overline{)8319} \\ \underline{78} \\ 519 \\ \underline{468} \\ 51 \end{array}$$

23.
$$\begin{array}{r} 61 \\ 89\overline{)5432} \\ \underline{534} \\ 92 \\ \underline{89} \\ 3 \end{array}$$

24.
$$\begin{array}{r} 98 \\ 99\overline{)9753} \\ \underline{891} \\ 843 \\ \underline{792} \\ 51 \end{array}$$

25.
$$\begin{array}{r} 1965 \\ 21\overline{)41268} \\ \underline{21} \\ 202 \\ \underline{189} \\ 136 \\ \underline{126} \\ 108 \\ \underline{105} \\ 3 \end{array}$$

26.
$$\begin{array}{r} 2396 \\ 31\overline{)74306} \\ \underline{62} \\ 123 \\ \underline{93} \\ 300 \\ \underline{279} \\ 216 \\ \underline{186} \\ 30 \end{array}$$

27.
$$\begin{array}{r} 2128 \\ 42\overline{)89415} \\ \underline{84} \\ 54 \\ \underline{42} \\ 121 \\ \underline{84} \\ 375 \\ \underline{336} \\ 39 \end{array}$$

28.
$$\begin{array}{r} 1304 \\ 52\overline{)67834} \\ \underline{52} \\ 158 \\ \underline{156} \\ 234 \\ \underline{208} \\ 26 \end{array}$$

29.
$$\begin{array}{r} 1267 \\ 63\overline{)79853} \\ \underline{63} \\ 168 \\ \underline{126} \\ 425 \\ \underline{378} \\ 473 \\ \underline{441} \\ 32 \end{array}$$

30.
$$\begin{array}{r} 1131 \\ 73\overline{)82569} \\ \underline{73} \\ 95 \\ \underline{73} \\ 226 \\ \underline{219} \\ 79 \\ \underline{73} \\ 6 \end{array}$$

31.
$$\begin{array}{r} 1123 \\ 84\overline{)94365} \\ \underline{84} \\ 103 \\ \underline{84} \\ 196 \\ \underline{168} \\ 285 \\ \underline{252} \\ 33 \end{array}$$

```
        1050
32. 94)98765
       94
       ---
        476
        470
        ---
         65
```

```
        3305
33. 25)82639
       75
       --
        76
        75
        ---
         139
         125
         ---
          14
```

```
        1839
34. 35)64372
       35
       ---
       293
       280
       ---
        137
        105
        ---
         322
         315
         ---
           7
```

```
        1283
35. 46)59036
       46
       ---
       130
        92
       ---
        383
        368
        ---
         156
         138
         ---
          18
```

```
         764
36. 56)42837
       392
       ---
        363
        336
        ---
         277
         224
         ---
          53
```

Ex. 49. Page 71.

```
       1258
1. 67)84317
      67
      ---
      173
      134
      ---
       391
       335
       ---
        567
        536
        ---
         31
```

```
        943
2. 77)72659
      693
      ---
       335
       308
       ---
        279
        231
        ---
         48
```

```
        738
3. 88)64980
      616
      ---
       338
       264
       ---
        740
        704
        ---
         36
```

4.
```
       532
   98)52196
      490
       319
       294
        256
        196
         60
```

5.
```
       1621
   29)47028
      29
      180
      174
       62
       58
        48
        29
        19
```

6.
```
       1906
   39)74369
      39
      353
      351
        269
        234
         35
```

7.
```
       3883
   14)54371
      42
      123
      112
       117
       112
         51
         42
          9
```

8.
```
       4572
   15)68594
      60
       85
       75
       109
       105
         44
         30
         14
```

9.
```
       4569
   16)73109
      64
       91
       80
       110
        96
        149
        144
          5
```

10.
```
       4856
   17)82563
      68
      145
      136
        96
        85
        113
        102
         11
```

11.
```
       5226
   18)94069
      90
       40
       36
        46
        36
        109
        108
          1
```

12.
```
       2523
   19)47938
      38
       99
       95
        43
        38
         58
         57
          1
```

13.
```
        19028
   23)437650
      23
      207
      207
         65
         46
         190
         184
           6
```

```
          18780
14.  35)657320
        35
        --
        307
        280
        ---
         273
         245
         ---
          282
          280
          ---
           20
```

```
           6958
15.  47)327045
        282
        ---
         450
         423
         ---
          274
          235
          ---
           395
           376
           ---
            19
```

```
          10712
16.  59)632008
        59
        --
         420
         413
         ---
           70
           59
           --
           118
           118
           ---
```

```
          13262
17.  33)437650
        33
        --
        107
         99
         --
         86
         66
         --
         205
         198
         ---
           70
           66
           --
            4
```

```
          14607
18.  45)657320
        45
        --
        207
        180
        ---
         273
         270
         ---
          320
          315
          ---
            5
```

```
           5737
19.  57)327045
        285
        ---
         420
         399
         ---
          214
          171
          ---
           435
           399
           ---
            36
```

```
           9159
20.  69)632008
        621
        ---
         110
          69
          --
         410
         345
         ---
          658
          621
          ---
           37
```

```
          10177
21.  43)437650
        43
        --
         76
         43
         --
         335
         301
         ---
          340
          301
          ---
           39
```

```
          11951
22.  55)657320
        55
        --
        107
         55
         --
        523
        495
        ---
         282
         275
         ---
          70
          55
          --
          15
```

$$\begin{array}{r} 4881 \\ \textbf{23.}\ 67\overline{)327045} \\ \underline{268} \\ 590 \\ \underline{536} \\ 544 \\ \underline{536} \\ 85 \\ \underline{67} \\ 18 \end{array}$$

$$\begin{array}{r} 8000 \\ \textbf{24.}\ 79\overline{)632008} \\ \underline{632} \\ 8 \end{array}$$

$$\begin{array}{r} 8257 \\ \textbf{25.}\ 53\overline{)437650} \\ \underline{424} \\ 136 \\ \underline{106} \\ 305 \\ \underline{265} \\ 400 \\ \underline{371} \\ 29 \end{array}$$

$$\begin{array}{r} 10112 \\ \textbf{26.}\ 65\overline{)657320} \\ \underline{65} \\ 73 \\ \underline{65} \\ 82 \\ \underline{65} \\ 170 \\ \underline{130} \\ 40 \end{array}$$

$$\begin{array}{r} 4247 \\ \textbf{27.}\ 77\overline{)327045} \\ \underline{308} \\ 190 \\ \underline{154} \\ 364 \\ \underline{308} \\ 565 \\ \underline{539} \\ 26 \end{array}$$

$$\begin{array}{r} 7101 \\ \textbf{28.}\ 89\overline{)632008} \\ \underline{623} \\ 90 \\ \underline{89} \\ 108 \\ \underline{89} \\ 19 \end{array}$$

$$\begin{array}{r} 6946 \\ \textbf{29.}\ 63\overline{)437650} \\ \underline{378} \\ 596 \\ \underline{567} \\ 295 \\ \underline{252} \\ 430 \\ \underline{378} \\ 52 \end{array}$$

$$\begin{array}{r} 8764 \\ \textbf{30.}\ 75\overline{)657320} \\ \underline{600} \\ 573 \\ \underline{525} \\ 482 \\ \underline{450} \\ 320 \\ \underline{300} \\ 20 \end{array}$$

$$\begin{array}{r} 3759 \\ \textbf{31.}\ 87\overline{)327045} \\ \underline{251} \\ 760 \\ \underline{609} \\ 514 \\ \underline{435} \\ 795 \\ \underline{783} \\ 12 \end{array}$$

$$\begin{array}{r} 6383 \\ \textbf{32.}\ 99\overline{)632008} \\ \underline{594} \\ 380 \\ \underline{297} \\ 830 \\ \underline{792} \\ 388 \\ \underline{297} \\ 91 \end{array}$$

```
            5995
**33.** 73)437650
           365
           ---
            726
            657
            ---
             695
             657
             ---
              380
              365
              ---
               15
```

```
            3371
**35.** 97)327045
           291
           ---
            360
            291
            ---
             694
             679
             ---
              155
               97
               --
               58
```

```
            7733
**34.** 85)657320
           595
           ---
            623
            595
            ---
             282
             255
             ---
              270
              255
              ---
               15
```

```
           21793
**36.** 29)632008
           58
           --
            52
            29
            --
            230
            203
            ---
             270
             261
             ---
               98
               87
               --
               11
```

Ex. 50. Page 71.

```
          500
1. 101)50576
       505
       ---
         76
```

```
          495
2. 102)50576
       408
       ---
        977
        918
        ---
         596
         510
         ---
          86
```

```
          249
3. 203)50576
       406
       ---
        997
        812
        ----
        1856
        1827
        ----
          29
```

4.
$$\begin{array}{r}
246\\
205\overline{)50576}\\
\underline{410}\\
957\\
\underline{820}\\
1376\\
\underline{1230}\\
146
\end{array}$$

5.
$$\begin{array}{r}
167\\
302\overline{)50576}\\
\underline{302}\\
2037\\
\underline{1812}\\
2256\\
\underline{2114}\\
142
\end{array}$$

6.
$$\begin{array}{r}
477\\
106\overline{)50576}\\
\underline{424}\\
817\\
\underline{742}\\
756\\
\underline{742}\\
14
\end{array}$$

7.
$$\begin{array}{r}
184\\
415\overline{)76593}\\
\underline{415}\\
3509\\
\underline{3320}\\
1893\\
\underline{1660}\\
233
\end{array}$$

8.
$$\begin{array}{r}
148\\
516\overline{)76593}\\
\underline{516}\\
2499\\
\underline{2064}\\
4353\\
\underline{4128}\\
225
\end{array}$$

9.
$$\begin{array}{r}
123\\
621\overline{)76593}\\
\underline{621}\\
1449\\
\underline{1242}\\
2073\\
\underline{1863}\\
210
\end{array}$$

10.
$$\begin{array}{r}
104\\
732\overline{)76593}\\
\underline{732}\\
3393\\
\underline{2928}\\
465
\end{array}$$

11.
$$\begin{array}{r}
90\\
843\overline{)76593}\\
\underline{7587}\\
723
\end{array}$$

12.
$$\begin{array}{r}
80\\
954\overline{)76593}\\
\underline{7632}\\
273
\end{array}$$

13.
$$\begin{array}{r}
123\\
781\overline{)96432}\\
\underline{781}\\
1833\\
\underline{1562}\\
2712\\
\underline{2343}\\
369
\end{array}$$

14.
$$\begin{array}{r}
162\\
592\overline{)96432}\\
\underline{592}\\
3723\\
\underline{3552}\\
1712\\
\underline{1184}\\
528
\end{array}$$

15.
$$\begin{array}{r}
111\\
864\overline{)96432}\\
\underline{864}\\
1003\\
\underline{864}\\
1392\\
\underline{864}\\
528
\end{array}$$

16.
$$\begin{array}{r}
99\\
972\overline{)96432}\\
\underline{8748}\\
8952\\
\underline{8748}\\
204
\end{array}$$

196
17. 492)96432
492
4723
4428
2952
2952

97
18. 993)96432
8937
7062
6951
111

Ex. 51. Page 72.

215
1. 4001)861345
8002
6114
4001
21135
20005
1130

420
2. 2048)861345
8192
4214
4096
1185

245
3. 3507)861345
7014
15994
14028
19665
17535
2130

134
4. 6409)861345
6409
22044
19227
28175
25636
2539

105
5. 8157)861345
8157
45645
40785
4860

217
6. 3965)861345
7930
6834
3965
28695
27755
940

86
7. 8403)730604
67224
58364
50418
7946

135
8. 7184)972817
7184
25441
21552
38897
35920
2977

97
9. 8794)854235
79146
62775
61558
1217

127
10. 5748)730604
5748
15580
11496
40844
40236
608

195
11. 4981)972817
4981
47471
44829
26427
24905
1522

368
12. 1984)730604
5952
13540
11904
16364
15872
492

Ex. 52. Page 72.

1. How many stoves can be bought for $1120, if one stove costs $35?

32
35)1120
105
70
70

32. *Ans.*

2. If one carriage is valued at $144, how many carriages can be bought at the same rate for $54,000?

375
144)54000
432
1080
1008
720
720

375. *Ans.*

3. A horse dealer bought a horse for $125. How many horses could he buy for $60,625, at the same rate?

485
125)60625
500
1062
1000
625
625

485. *Ans.*

4. How many barrels of sugar can be bought for $8352 when $36 is paid for one barrel?

232
36)8352
72
115
108
72
72

232. *Ans.*

5. A merchant sold 297 barrels of flour for $2673. How much did he get a barrel?

$$\begin{array}{r} 9 \\ 297\overline{)2673} \\ \underline{2673} \end{array}$$

$9. *Ans.*

6. George Clifford paid $10,250 for oxen, paying on the average $82 an ox. How many did he buy?

$$\begin{array}{r} 125 \\ 82\overline{)10250} \\ \underline{82} \\ 205 \\ \underline{164} \\ 410 \\ \underline{410} \end{array}$$

125. *Ans.*

7. How many days will it take a man to dig a ditch 864 feet long, if he can dig 48 feet a day?

$$\begin{array}{r} 18 \\ 48\overline{)864} \\ \underline{48} \\ 384 \\ \underline{384} \end{array}$$

18. *Ans.*

8. One share of a certain bank stock is worth $98. How many shares can be bought for $22,050?

$$\begin{array}{r} 225 \\ 98\overline{)22050} \\ \underline{196} \\ 245 \\ \underline{196} \\ 490 \\ \underline{490} \end{array}$$

225. *Ans.*

9. A farmer sold 19 sheep for $152. For how much a head did he sell them?

$$\begin{array}{r} 8 \\ 19\overline{)152} \\ \underline{152} \end{array}$$

$8. *Ans.*

10. John Jones paid $1752 for lambs at an average price of $4. How many did he buy?

$$\begin{array}{r} 4\underline{)1752} \\ 438 \end{array}$$

438. *Ans.*

11. A fruit grower received $1755 for 195 barrels of cranberries. What was the price per barrel?

$$\begin{array}{r} 9 \\ 195\overline{)1755} \\ \underline{1755} \end{array}$$

$9. *Ans.*

12. In one square foot there are 144 square inches. How many square feet in 1,375,920 square inches?

9555
144)1375920
1296
799
720
792
720
720
720

9555. *Ans.*

13. A public library has a yearly circulation of 56,966 books. How many books are taken daily, if the library is open 313 days in a year?

182
313)56966
313
2566
2504
626
626

182. *Ans.*

14. One mile contains 320 rods. How many miles in 348,160 rods?

1088
$32\cancel{0})34816\cancel{0}$
32
281
256
256
256

1088. *Ans.*

15. Dividend 514,478, divisor 327, remainder 107. What is the quotient?

514478
107
514371

1573
327)514371
327
1873
1635
2387
2289
981
981

1573. *Ans.*

16. A railroad 478 miles in length cost $3,500,872. What was the average cost per mile?

7324
478)3500872
3346
1548
1434
1147
956
1912
1912

$7324. *Ans.*

17. How many house lots, at $321 for each, can be bought for $772,326?

2406
321)772326
642
1303
1284
1926
1926

2406. *Ans.*

18. A company of 547 men took equal shares in a mine valued at $705,083. How much money did each man invest?

1289
547)705083
547
1580
1094
4868
4376
4923
4923

$1289. *Ans.*

19. If 325 workmen are paid $583,700, what sum does each receive?

1796
325)583700
325
2587
2275
3120
2925
1950
1950

$1796. *Ans.*

20. At $89 per acre, how many acres of land can be purchased for $713,513?

8017
89)713513
712
151
89
623
623

8017. *Ans.*

21. Divide one million three hundred seventy-five thousand eight hundred nine by two hundred eighty-seven.

4793
287)1375809
1148
2278
2009
2690
2583
1079
861
218

4793 with 218 rem. *Ans.*

22. A ship averaging 215 miles per day has to sail 3678 miles. How many days will be required for the trip?

17
215)3678
215
1528
1505
23

17 days, with 23 miles to sail on the 18th day. *Ans.*

23. A New Orleans merchant sends to New York 376,705 gallons of molasses. How many casks will there be if each cask contains 235 gallons?

$$\begin{array}{r}1603\\ 235)\overline{376705}\\ \underline{235}\\ 1417\\ \underline{1410}\\ 705\\ \underline{705}\end{array}$$

1603. *Ans.*

24. The capital and surplus of a bank amounting to $518,077 belonged to 679 stockholders. What is the average amount belonging to each stockholder?

$$\begin{array}{r}763\\ 679)\overline{518077}\\ \underline{4753}\\ 4277\\ \underline{4074}\\ 2037\\ \underline{2037}\end{array}$$

$763. *Ans.*

25. If 34,823 tons of coal are required for 97 steamships, what is the average number of tons for each?

$$\begin{array}{r}359\\ 97)\overline{34823}\\ \underline{291}\\ 572\\ \underline{485}\\ 873\\ \underline{873}\end{array}$$

359. *Ans.*

26. A carpet factory running 45 looms makes 17,820 yards of carpet in a fortnight. What number of yards is woven by each loom on the average?

$$\begin{array}{r}396\\ 45)\overline{17820}\\ \underline{135}\\ 432\\ \underline{405}\\ 270\\ \underline{270}\end{array}$$

396. *Ans.*

27. A cotton planter raises 428,243 pounds of cotton. If the cotton is put into bales, weighing on the average 401 pounds, what will be the whole number of bales?

$$\begin{array}{r}1067\\ 401)\overline{428243}\\ \underline{401}\\ 2724\\ \underline{2406}\\ 3183\\ \underline{2807}\\ 376\end{array}$$

1067 bales, with 376 pounds left over. *Ans.*

28. In one cubic foot there are 1728 cubic inches. How many cubic feet are there in a pile of wood containing 3,507,840 cubic inches?

$$\begin{array}{r} 2030 \\ 1728\overline{)3507840} \\ \underline{3456} \\ 5184 \\ \underline{5184} \end{array}$$

2030. *Ans.*

29. In how many hours will a cistern holding 3330 gallons be filled by a pipe that discharges into it 185 gallons an hour?

$$\begin{array}{r} 18 \\ 185\overline{)3330} \\ \underline{185} \\ 1480 \\ \underline{1480} \end{array}$$

18. *Ans.*

30. An army officer paid $107 for a horse. At that rate how many horses can he buy for $317,897?

$$\begin{array}{r} 2971 \\ 107\overline{)317897} \\ \underline{214} \\ 1038 \\ \underline{963} \\ 759 \\ \underline{749} \\ 107 \\ \underline{107} \end{array}$$

2971. *Ans.*

31. A man having an income of $3874 a year (52 weeks) spent $2314 and saved the rest. How much did he save per week on the average?

$$\begin{array}{r} \$3874 \\ \underline{2314} \\ \$1560 \end{array}$$

$$\begin{array}{r} 30 \\ 52\overline{)1560} \\ \underline{156} \end{array}$$

$30. *Ans.*

32. What number subtracted 88 times from 80,005 will leave 13 as a remainder?

$$\begin{array}{r} 80005 \\ \underline{13} \\ 79992 \end{array}$$

$$\begin{array}{r} 909 \\ 88\overline{)79992} \\ \underline{792} \\ 792 \\ \underline{792} \end{array}$$

909. *Ans.*

33. How many rolls of carpet at $75 a roll can be bought for $1275?

$$\begin{array}{r} 17 \\ 75\overline{)1275} \\ \underline{75} \\ 525 \\ \underline{525} \end{array}$$

17. *Ans.*

34. A has 425 horses valued at $58,650; B has 382 acres of land worth $48,514. What is the difference in value between one of A's horses and an acre of B's land?

$$\begin{array}{r} 138 \\ 425\overline{)58650} \\ \underline{425} \\ 1615 \\ \underline{1275} \\ 3400 \\ \underline{3400} \end{array} \qquad \begin{array}{r} 127 \\ 382\overline{)48514} \\ \underline{382} \\ 1031 \\ \underline{764} \\ 2674 \\ \underline{2674} \end{array}$$

$138 – $127 = $11. *Ans.*

35. If the dividend is 325,682, the divisor 284, and the remainder 218, what is the quotient?

$$\begin{array}{r} 325682 \\ \underline{218} \\ 325464 \end{array}$$

$$\begin{array}{r} 1146 \\ 284\overline{)325464} \\ \underline{284} \\ 414 \\ \underline{284} \\ 1306 \\ \underline{1136} \\ 1704 \\ \underline{1704} \end{array}$$

1146. *Ans.*

36. What is the nearest number to 7196 that will contain 372 without a remainder?

$$\begin{array}{r} 19 \\ 372\overline{)7196} \\ \underline{372} \\ 3476 \\ \underline{3348} \\ 128 \end{array}$$

$$\begin{array}{r} 7196 \\ \underline{128} \\ 7068 \end{array}$$

7068 *Ans.*

37. New York contains 47,620 square miles, Texas 262,290. How many states as large as New York can be made out of Texas, and how many square miles will be left over?

$$\begin{array}{r} 5 \\ 4762\cancel{0}\overline{)26229\cancel{0}} \\ \underline{23810} \\ 2419 \end{array}$$

5; 2419. *Ans.*

38. Dakota contains 147,700 square miles, Massachusetts 8040. How many states as large as Massachusetts can be made out of Dakota, and how many square miles will be left over?

$$\begin{array}{r} 18 \\ 804\cancel{0}\overline{)14770\cancel{0}} \\ \underline{804} \\ 6730 \\ \underline{6432} \\ 298 \end{array}$$

18; 298. *Ans.*

39. In 1880 Texas produced 550,872,000 pounds of cotton. Allowing 400 pounds to a bale, how many bales of cotton did Texas raise that year?

$$\begin{array}{l} 4\cancel{0}\cancel{0})\underline{5508720\cancel{0}\cancel{0}} \\ \quad 1377180 \end{array}$$

1,377,180. *Ans.*

40. If one pound of sugar is obtained from 18 sugar canes, how many pounds will be obtained from 1,233,216 canes?

$$\begin{array}{r} 68512 \\ 18)\overline{1233216} \\ 108 \\ \hline 153 \\ 144 \\ \hline 92 \\ 90 \\ \hline 21 \\ 18 \\ \hline 36 \\ 36 \\ \hline \end{array}$$

68,512. *Ans.*

Ex. 53. Page 81.

1\.
2.514
3.7
9.6304
0.24876
16.09316

2\.
1.916
6.3
0.4782
9.35634
18.05054

3\.
0.415
8.0
6.3746
8.29426
23.08386

4\.
7.516
9.6
1.9238
7.21442
26.25422

5\.
7.03
7.2456
0.483
9.23579
8.3
32.29439

6\.
2.576
3.4203
1.5
6.27948
0.362357
14.138137

7\.
3.29
15.671
0.0053
22.67
41.6363

8\.
14.2351
651.
2.219
3.157
670.6111

9\.
213.7
2.913
14.769
0.007871
231.389871

10\.
1.4178
0.2
2.356709
1.14
2.0
7.114509

11.
4.96
3.2728
0.7
3.54219
4.7
17.17499

12.
1.198
3.5
7.635487
4.23
1.5724
18.135887

13.
4.372
9.5
7.369248
1.72
3.2948
26.256048

14.
0.4293
0.7
6.954326
3.14
7.005
18.228626

15.
3.87
2.6493
0.8
2.63495
9.3
19.25425

16.
6.9
5.71
0.0431
329.2
4.4
346.2531

17.
3.571
0.008
12.51
649.
3.051
668.140

18.
15.753
2.069
17.6143
3.2107
38.6470

19.
1.1
20.02
13.
2.845
1.0001
37.9651

20.
31.826
3.471
0.004
45.
0.6
80.901

21.
82.537
2000.
1.354
0.006
13.
2096.897

22.
64.27
1.1
23.
17.12
8.8
114.29

23.
72.5
140.
340.03
21.5715
4.00087
578.10237

24.
0.96
7.3004
8010.
0.00093
124650.
132668.26133

Ex. 54. Page 82.

1. $\begin{array}{r}0.58\\ \underline{0.39}\\ 0.19\end{array}$

2. $\begin{array}{r}0.67\\ \underline{0.59}\\ 0.08\end{array}$

3. $\begin{array}{r}3.927\\ \underline{1.836}\\ 2.091\end{array}$

4. $\begin{array}{r}4.825\\ \underline{1.763}\\ 3.062\end{array}$

5. $\begin{array}{r}4.325\\ \underline{1.672}\\ 2.653\end{array}$

6. $\begin{array}{r}6.283\\ \underline{3.576}\\ 2.707\end{array}$

7. $\begin{array}{r}9.025\\ \underline{6.387}\\ 2.638\end{array}$

8. $\begin{array}{r}6.275\\ \underline{3.829}\\ 2.446\end{array}$

9. $\begin{array}{r}7.570\\ \underline{6.385}\\ 1.185\end{array}$

10. $\begin{array}{r}9.260\\ \underline{2.375}\\ 6.885\end{array}$

11. $\begin{array}{r}8.400\\ \underline{3.228}\\ 5.172\end{array}$

12. $\begin{array}{r}9.500\\ \underline{2.732}\\ 6.768\end{array}$

13. $\begin{array}{r}14.3846\\ \underline{4.8003}\\ 9.5843\end{array}$

14. $\begin{array}{r}3.4370\\ \underline{0.3045}\\ 3.1325\end{array}$

15. $\begin{array}{r}0.3290\\ \underline{0.0089}\\ 0.3201\end{array}$

16. $\begin{array}{r}136.0200\\ \underline{1.5423}\\ 134.4777\end{array}$

17. $\begin{array}{r}1.9990\\ \underline{0.0630}\\ 1.9360\end{array}$

18. $\begin{array}{r}13.5298\\ \underline{10.0060}\\ 3.5238\end{array}$

19. $\begin{array}{r}2.1808\\ \underline{0.0009}\\ 2.1799\end{array}$

20. $\begin{array}{r}1.9870\\ \underline{1.0873}\\ 0.8997\end{array}$

21. $\begin{array}{r}48.9370\\ \underline{30.3000}\\ 18.6370\end{array}$

22. $\begin{array}{r}0.9990\\ \underline{0.9009}\\ 0.0981\end{array}$

23. $\begin{array}{r}15.1409\\ \underline{3.8579}\\ 11.2830\end{array}$

24. $\begin{array}{r}5.9009\\ \underline{0.0909}\\ 5.8100\end{array}$

25. $\begin{array}{r}1.3993\\ \underline{0.9090}\\ 0.4903\end{array}$

26. $\begin{array}{r}10.1010\\ \underline{0.0999}\\ 10.0011\end{array}$

27. $\begin{array}{r}3.500\\ \underline{0.075}\\ 3.425\end{array}$

28.
517.0000
0.0076
516.9924

29.
1.3250
0.4736
0.8514

30.
192.300
17.294
175.006

31.
175.8000
1.0024
174.7976

32.
186.257
13.794
172.463

33.
0.71500
0.70451
0.01049

34.
1111.11600
22.22222
1088.89378

35.
71.0047000
9.0008167
62.0038833

36.
9161.00980
7149.16716
2011.84264

Ex. 55. Page 85.

1.
5
0.3
1.5

2.
8
0.27
56
16
2.16

3.
12
0.375
60
84
36
4.500

4.
15
0.256
90
75
30
3.840

5.
9
0.7
6.3

6.
6
0.75
30
42
4.50

7.
16
0.284
64
128
32
4.544

8.
11
0.386
66
88
33
4.246

9.
10
0.65
6.50

10.
100
0.721
72.100

11.
1000
3.736
3736.000

12.
1000
0.074
74.000

13.
10
0.99
9.90

14.
100
0.615
61.500

15.
$$\begin{array}{r} 1000 \\ 2.409 \\ \hline 2409. \end{array}$$

16.
$$\begin{array}{r} 1000 \\ 0.055 \\ \hline 55.00 \end{array}$$

17.
$$\begin{array}{r} 0.5 \\ 37 \\ \hline 35 \\ 15 \\ \hline 18.5 \end{array}$$

18.
$$\begin{array}{r} 0.9 \\ 99 \\ \hline 81 \\ 81 \\ \hline 89.1 \end{array}$$

19.
$$\begin{array}{r} 0.25 \\ 428 \\ \hline 200 \\ 50 \\ 100 \\ \hline 107.00 \end{array}$$

20.
$$\begin{array}{r} 0.36 \\ 7384 \\ \hline 144 \\ 288 \\ 108 \\ 252 \\ \hline 2658.24 \end{array}$$

21.
$$\begin{array}{r} 0.9 \\ 26 \\ \hline 54 \\ 18 \\ \hline 23.4 \end{array}$$

22.
$$\begin{array}{r} 0.7 \\ 67 \\ \hline 49 \\ 42 \\ \hline 46.9 \end{array}$$

23.
$$\begin{array}{r} 0.48 \\ 237 \\ \hline 336 \\ 144 \\ 96 \\ \hline 113.76 \end{array}$$

24.
$$\begin{array}{r} 0.18 \\ 3692 \\ \hline 36 \\ 162 \\ 108 \\ 54 \\ \hline 664.56 \end{array}$$

25.
$$\begin{array}{r} 0.312 \\ 425 \\ \hline 1560 \\ 624 \\ 1248 \\ \hline 132.600 \end{array}$$

26.
$$\begin{array}{r} 0.716 \\ 388 \\ \hline 5728 \\ 5728 \\ 2148 \\ \hline 277.808 \end{array}$$

27.
$$\begin{array}{r} 0.725 \\ 96 \\ \hline 4350 \\ 6525 \\ \hline 69.600 \end{array}$$

28.
$$\begin{array}{r} 0.085 \\ 88 \\ \hline 680 \\ 680 \\ \hline 7.480 \end{array}$$

29.
$$\begin{array}{r} 0.624 \\ 617 \\ \hline 4368 \\ 624 \\ 3744 \\ \hline 385.008 \end{array}$$

30.
$$\begin{array}{r} 0.358 \\ 776 \\ \hline 2148 \\ 2506 \\ 2506 \\ \hline 277.808 \end{array}$$

31.
0.145
48
1160
580
6.960

32.
0.017
44
68
68
0.748

33.
57
9.4
228
513
535.8

34.
26
3.8
208
78
98.8

35.
972.3
3
2916.9

36.
65
87.2
130
455
520
5668.0

37.
2.8
83
84
224
232.4

38.
3.2
64
128
192
204.8

39.
7.8
369
702
468
234
2878.2

40.
3.7
815
185
37
296
3015.5

41.
1.44
9.6
864
1296
13.824

42.
2.88
4.8
2304
1152
13.824

43.
3.21
72.5
1605
642
2247
232.725

44.
2.16
40.7
1512
8640
87.912

45.
3.26
4.37
2282
978
1304
14.2462

46.
2.03
3.207
1421
4060
609
6.51021

47.
2.472
9.525
12360
4944
12360
22248
23.545800

48.
$$\begin{array}{r} 3.264 \\ 3.045 \\ \hline 16320 \\ 13056 \\ 97920 \\ \hline 9.938880 \end{array}$$

49.
$$\begin{array}{r} 0.7 \\ 0.5 \\ \hline 0.35 \end{array}$$

50.
$$\begin{array}{r} 0.9 \\ 0.57 \\ \hline 63 \\ 45 \\ \hline 0.513 \end{array}$$

51.
$$\begin{array}{r} 0.45 \\ 0.57 \\ \hline 315 \\ 225 \\ \hline 0.2565 \end{array}$$

52.
$$\begin{array}{r} 0.72 \\ 0.324 \\ \hline 288 \\ 144 \\ 216 \\ \hline 0.23328 \end{array}$$

53.
$$\begin{array}{r} 0.6 \\ 0.9 \\ \hline 0.54 \end{array}$$

54.
$$\begin{array}{r} 0.8 \\ 0.96 \\ \hline 48 \\ 72 \\ \hline 0.768 \end{array}$$

55.
$$\begin{array}{r} 0.72 \\ 0.72 \\ \hline 144 \\ 504 \\ \hline 0.5184 \end{array}$$

56.
$$\begin{array}{r} 0.36 \\ 0.648 \\ \hline 288 \\ 144 \\ 216 \\ \hline 0.23328 \end{array}$$

57.
$$\begin{array}{r} 416 \\ 0.416 \\ \hline 2496 \\ 416 \\ 1664 \\ \hline 173.056 \end{array}$$

58.
$$\begin{array}{r} 57 \\ 0.015 \\ \hline 285 \\ 57 \\ \hline 0.855 \end{array}$$

59.
$$\begin{array}{r} 693 \\ 0.83 \\ \hline 2079 \\ 5544 \\ \hline 575.19 \end{array}$$

60.
$$\begin{array}{r} 4.625 \\ 7.14 \\ \hline 18500 \\ 4625 \\ 32375 \\ \hline 33.02250 \end{array}$$

61.
$$\begin{array}{r} 99.9 \\ 4.09 \\ \hline 8991 \\ 39960 \\ \hline 408.591 \end{array}$$

62.
$$\begin{array}{r} 753 \\ 0.672 \\ \hline 1506 \\ 5271 \\ 4518 \\ \hline 506.016 \end{array}$$

63.
$$\begin{array}{r} 928 \\ 8.302 \\ \hline 1856 \\ 27840 \\ 7424 \\ \hline 7704.256 \end{array}$$

64.
56.704
0.413
170112
56704
226816
23.418752

65.
2.052
0.0037
14364
6156
0.0075924

66.
0.00948
29
8532
1896
0.27492

67.
372
0.468
2976
2232
1488
174.096

68.
9.43
0.054
3772
4715
0.50922

69.
786
3.62
1572
4716
2358
2845.32

70.
0.632
85
3160
5056
53.720

71.
2.406
0.008
0.019248

72.
6824
3.7
47768
20472
25248.8

73.
42.53
0.685
21265
34024
25518
29.13305

74.
0.832
59
7488
4160
49.088

75.
763.24
4.078
610592
534268
3052960
3112.49272

Ex. 56. Page 87.

1.
8
428)3424.
3424

2.
4
614)2456.
2456

3.
9.2
575)5290.
5175
1150
1150

4.
5.5
6832)37576
34160
34160
34160

36
5. 7812)281232.
23436
46872
46872

18.9
6. 516)9752.4
516
4592
4128
4644
4644

32091
7. 0023)738093
69
48
46
209
207
23
23

5.083
8. 102)518.466
510
846
816
306
306

0.001875
9. 96)00.180
96
840
768
720
672
480
480

91.78
10. 381)34968.18
3429
678
381
2971
2667
3048
3048

0 .000125
11. 25)0.003125
25
62
50
125
125

6.3
12. 1365)8599.5
8190
4095
4095

68.35
13. 08)546.8
48
66
64
28
24
40
40

21.4
14. 0023)0492.2
46
32
23
92
92

0.03965
15. 0112)0004.4408
336
1080
1008
728
672
560
560

24.3
16. 0084)2041.2
168
361
324
372
372

0.0032
17. 2345)07.504
7035
4690
4690

0.0001
18. 25)0.0025
25

0.000025736
19. 1250)0.03217
2500
7170
6250
9200
8750
4500
3750
7500
7500

6.3
20. 273)1719.9
1638
819
819

0.0115
21. 107)01.2305
107
160
107
535
535

6.25
22. 25)156.25
150
62
50
125
125

2.1
23. 258)541.8
516
258
258

21.4
24. 0276)5906.4
552
386
276
1104
1104

32.09
25. 023)738.07
69
48
46
207
207

813.4
26. 019)15454.6
152
25
19
64
57
76
76

0.104
27. 647)67.288
647
2588
2588

0.5025
28. 144)72.36
720
360
288
720
720

0.001
29. 1124)01.124
1124

30. 5)15.625
3.125

6400
31. 00128)819200
768
512
512

32.
0.0025
2048)005.120
4096
10240
10240

33.
0004)0097.2
24.3

34.
0.0032
2345)07.504
7035
4690
4690

35.
1.3
117)152.1
117
351
351

36.
008)6000.
750

37.
30000
00016)480000
48

38.
6250000
00025)156250000
150
62
50
125
125

39.
4000
016)64000
64

40.
1200
0048)57600
48
96
96

41.
0006)30120.
5020

42.
79347000
11575)918441525000
81025
108191
104175
40165
34725
54402
46300
81025
81025

43.
2000
0035)70000
70

44.
1.23
319)392.37
319
733
638
957
957

0.637
5072)3230.864
30432
18766
15216
35504
35504

46.
1240
.0025)31000
25
60
50
100
100

47.
348
18345)6384060
55035
88056
73380
146760
146760

48.
490000
00037)18130000
148
333
333

49.
4.8828125
256)1250.0
1024
2260
2048
2120
2048
720
512
2080
2048
320
256
640
512
1280
1280

50. 00004)28474320
7118580

51. 0004)1304000
326000

52.
10500
0108)1134000
108
540
540

53.
74.6
9246)689751.6
64722
42531
36984
55476
55476

54.
0.725
0306)0221.85
2142
765
612
1530
1530

55.
0.746
371)276.766
2597
1706
1484
2226
2226

56.
22000
013)286000
26
26
26

57.
34.3168
003125)107240.0
9375
13490
12500
9900
9375
5250
3125
21250
18750
25000
25000

58.
001)030.
30.

59.
2.4
4375)10500.0
8750
17500
17500

60.
290
0292)84680
584
2628
2628

Ex. 57. Page 89.

1. To enclose a certain lot 225 yards of fence are needed. What will be the cost of the fence at the rate of $0.50 a yard?

225
0.50
112.50

$112.50 *Ans.*

2. A section of land costs $49,878; what must be paid for 0.375 of a section?

$49878
0.375
249390
349146
149634
$18,704.250 *Ans.*

3. When 0.7 of a ton of coal is worth $6.30, what will be the cost of 12.5 tons?

7)$63.
$9 = price of 1 ton.

12.5
9
112.50

$112.50 *Ans.*

4. Coal being worth $7.00 per ton, what part of a ton can be bought for $2.59?

$7)$2.59
0.37 *Ans.*

5. If a man can build 0.45 of a rod of wall in one hour, how many rods will 4 men build in 3.8 days, working 7.5 hours per day?

7.5
3.8
600
225
28.50
4
114.0
0.45
570
456
51.30 *Ans.*

6. Twelve dozen penknives cost \$90. If they are sold at \$0.75 each, what will be the gain on each?

\$0.625
144)\$90.0
864
360
288
720
720

\$0.75
0.625
\$0.125 *Ans.*

7. Divide \$125.15 by \$25.03.

5
\$2503)\$12515
12515

5. *Ans.*

8. Twelve yards of velvet cost \$150. At that rate, what must be paid for 18 yards?

12)\$150.00
\$12.50
18
10000
1250
\$225.00 *Ans.*

9. What will be the cost of 9.75 cords of white oak wood, at the rate of \$10 a cord?

9.75
10
97.50
\$97.50 *Ans.*

10. Twenty-five hundredths of a farm cost \$5000; what will nine-tenths of it cost?

20000
25)500000
50

\$20000
0.9
\$18000.0 *Ans.*

11. A merchant bought 575 pounds of sugar for \$51.75; he sold four-tenths of it at \$0.11 per pound, and the remainder at \$0.125. What was his gain?

575
0.4
230.0
0.11
230
230
25.30

575.
230.
345.
0.125
1725
690
345
43.125
25.30
68.425
51.75
16.675

$16.675. *Ans.*

12. A railroad train has 201 miles to run. If it averages 26.8 miles per hour, how many hours will be required?

7.5
268)2010.0
1876
1340
1340

7.5. *Ans.*

13. Hiram Jones owes to one man $1000, to another $75.02, to another $198.75, and to a fourth $325.50. How much money will he need to pay these debts?

$1000.
75.02
198.75
325.50

$1599.27 *Ans.*

14. A man bought 80 yards of cotton cloth for $18.40. Find the price of the cloth per yard.

80)$18.40

$0.23 *Ans.*

15. How many yards of calico at $0.125 per yard can be bought for $45.625?

365
$125)$45625
375
812
750
625
625

365. *Ans.*

16. A farmer spent $303.75 for corn at $1.35 a bag. How many bags of corn did he buy?

225
$135)$30375
270
327
270
675
675

225. *Ans.*

17. One pound of dry oak wood when burnt yields 0.022 of a pound of ashes. What part of the pound disappears into the air?

$$\begin{array}{r}1.000\\ 0.022\\ \hline 0.978\ \textit{Ans.}\end{array}$$

18. Before a storm the mercury in a barometer fell from 30.292 inches to 29.347 inches. What part of an inch did it fall?

$$\begin{array}{r}30.292\\ 29.347\\ \hline 0.945\ \textit{Ans.}\end{array}$$

19. John purchased goods to the amount of \$7.48. He gave the salesman a ten-dollar bill. How much money should he receive?

$$\begin{array}{r}\$10.00\\ 7.48\\ \hline \$2.52\ \textit{Ans.}\end{array}$$

20. The distance from New York to Chicago by the New York Central and Lake Shore route is 982.24 miles, and the distance from New York to Buffalo is 441.75 miles. What is the distance from Buffalo to Chicago?

$$\begin{array}{r}982.24\\ 441.75\\ \hline 540.49\ \textit{Ans.}\end{array}$$

21. Excursion tickets from Boston to Fabyan's and return cost \$7.75, from Fabyan's to the summit of Mt. Washington and return \$3. If a person takes this trip and pays \$4.50 for supper, lodging, and breakfast at the Summit House on Mt. Washington, and \$1.25 for dinner at Fabyan's the next day, how much will the whole trip cost?

$$\begin{array}{r}\$7.75\\ 3.00\\ 4.50\\ 1.25\\ \hline \$16.50\ \textit{Ans.}\end{array}$$

22. From an ice-house containing 1000 tons of ice the owner sold at different times 242.765 tons, 92.325 tons, 161.575 tons, and 479.312 tons. The rest melted. How many tons melted?

$$\begin{array}{r}242.765\\ 92.325\\ 161.575\\ 479.312\\ \hline 975.977\end{array}$$

$$\begin{array}{r}1000.\\ 975.977\\ \hline 24.023\ \textit{Ans.}\end{array}$$

Ex. 58. Page 91.

1. What will 9875 feet of boards cost at $9 per M?

9.875
9
88.875
$88.88. *Ans.*

2. At $3.25 per C, what must be paid for 3784 feet of Georgia pine?

37.84
3.25
18920
7568
11352
122.9800
$122.98. *Ans.*

3. For the roof of a building 8000 tiles are to be used. What will they cost at $9.875 per M?

$9.875
8
$79.000 *Ans.*

4. Required the cost of 98,762 laths at $0.35 per C.

987.62
0.35
493810
296286
345.6670
$345.67. *Ans.*

5. An architect estimates that 1,500,784 bricks will be needed for a schoolhouse. What will they cost at $7.75 a thousand?

1500.784
7.75
7503920
10505488
10505488
11,631.07600
$11,631.08. *Ans.*

6. What must be paid for 4879 paving stones at $9.375 a hundred?

$9.375
48.79
84375
65625
75000
37500
$457.40625
$457.41. *Ans.*

7. If the freight from New York to Boston is $0.12 per hundred pounds, what must be paid on five boxes of goods weighing respectively 348.25, 227.25, 429.25, 396.125, 419.125 pounds?

348.25
227.25
429.25
396.125
419.125
1820.000

18.2
0.12
364
182
2.184
$2.18. *Ans.*

8. A lumber dealer paid $4.50 per M for cedar shingles and sold them for $5.75. What did he gain on 35 M?

$5.75
4.50
$1.25
35
625
375
$43.75 *Ans.*

9. A farmer contracted for boards for fencing at the rate of $12.375 per M. His bill for lumber amounted to $61.875. How many thousand feet did he buy?

5
12375)61875
61875
5 M. *Ans.*

10. What must be paid for 9785 pounds of plaster at $6.75 per ton?

$2\cancel{0}\cancel{0}\cancel{0})9\cancel{7}\cancel{8}\cancel{5}$
4.8925
6.75
244625
342475
293550
33.024375
$33.02. *Ans.*

11. If 25,000 pounds of plaster cost $131.25, what is that per ton?

$2\cancel{0}\cancel{0}\cancel{0})25\cancel{0}\cancel{0}\cancel{0}$
12.5 tons.
10.5
125)1312.5
125
625
625
$10.50. *Ans.*

12. A dealer in New York retails coal at $7.75 per ton. If a ton costs $3.75 at the mine and $0.75 for freight, what will he make on 8758 pounds of coal?

$3.75	$7.75
.75	4.50
$4.50	$3.25

$2\cancel{0}\cancel{0}\cancel{0})8\cancel{7}\cancel{5}\cancel{8}$
4.379 tons.
3.25
21895
8758
13137
14.23175
$14.23. *Ans.*

13. At $10.50 per ton, what is the cost of 25,000 pounds of plaster?

$2\cancel{0}\cancel{0}\cancel{0})25\cancel{0}\cancel{0}\cancel{0}$
12.5 tons.
10.50
6250
1250
131.250
$131.25. *Ans.*

14. What is the retail price of coal per ton when 17,520 pounds are sold for $74.46?

$2\cancel{0}\cancel{0}\cancel{0})17\cancel{5}\cancel{2}\cancel{0}$
8.76 tons.

8.50
876)7446.0
7008
4380
4380

$8.50. *Ans.*

15. How many pounds of plaster at $10.50 per ton can be bought for $131.25?

12.5
105)1312.5
105
262
210
525
525

12.5 × 2000 = 25000 pounds. *Ans.*

16. An errand boy receives $2.75 a week. In how many weeks will he earn $44?

16
275)4400
275
1650
1650

16. *Ans.*

17. How many cords of pine wood at $3.375 a cord must be given for 12 yards of broadcloth at $2.25 a yard?

$2.25
12
450
225
$27.00

8
3375)27000
27000

8. *Ans.*

18. The milk from a herd of 75 cows, at 6 cents a quart, amounted in one summer to $2025. How many quarts were sold?

6)202500
33,750 *Ans.*

19. A merchant sold three pieces of matting, each containing 45.5 yards, at $0.375 per yard. How much money did he receive?

$0.375
45.5
1875
1875
1500
$17.0625
3
$51.1875

$51.19. *Ans.*

20. If a man earns $12 a week and spends on the average $10.125, in how many weeks will he save $97.50?

$12
10.125
$1.875

52
1875)97500
9375
3750
3750

52. *Ans.*

21. A grocer bought 156 boxes of oranges at $5.625 each, and sold the whole for $916.875. How much did he gain?

$5.625
156
33750
28125
5625
$877.500

$916.875
877.500
$39.375 *Ans.*

22. A Western farmer's wheat crop at $1.08 per bushel brings $831.60. How many bushels did he raise?

770
108)83160
756
756
756

770. *Ans.*

23. Find the cost of 15,964 feet of boards at $39.25 a thousand.

15.964
39.25
79820
31928
143676
47892
626.58700
$626.59. *Ans.*

24. Find the cost of 19,500 laths at 35 cents a hundred.

195
0.35
975
585
68.25
$68.25. *Ans.*

25. What will be paid for shipping 1500 tons of wheat from Buffalo to New York at the rate of 5 cents a bushel? (A bushel of wheat weighs 60 pounds.)

1500
2000
$6\cancel{0})300000\cancel{0}$ pounds.
50000 bushels.
0.05
2500.00
$2500. *Ans.*

Ex. 59. Page 94.

1. Find the price of 30 Parian statuettes at $8.875 each.

$8.875
30
$266.250 *Ans.*

2. In February, 1884, the number of days during which rain fell in New England was 22, and the amount which fell was 4.57 inches. Find the daily average for the 22 days.

0.2077.....
22)4.57
44
170
154
160
154
6

0.2077 inch. *Ans.*

3. How many acres are in a park containing 0.08 of 115.1875 acres?

115.1875
0.08
9.215000

9.215. *Ans.*

4. If 31.75 rods of fence are made for $10.90, what is the cost of a rod?

0.34.....
3175)1090.0
9525
13750
12700
1050

$0.34..... *Ans.*

5. On a certain day in February, 1884, the thermometer at the highest was 51.1°, and at the lowest 29.4°. Find the difference.

51.1
29.4
21.7 *Ans.*

6. Of 100 parts of matter in beans, sugar and gum form 61.10, other vegetable matter forms 31.55, and moisture 5 parts. Of how many parts does the remainder, which is mineral matter, consist?

61.10
31.55
5.00
97.65

100
97.65
2.35 *Ans.*

7. If 0.1571 of the weight of superphosphate is organic matter, find the weight in tons of organic matter in 80 tons of superphosphate.

0.1571
80
12.5680

12.568. *Ans.*

8. In January, 1884, the barometer at the highest was 30.543 inches, and at the lowest 28.843 inches. Find the difference.

30.543
28.843
1.700

1.7. *Ans.*

9. A cubic inch of pure water weighs 252.458 grains. Find the weight in grains of a cylindrical inch, which is 0.7854 of a cubic inch.

252.458
0.7854
1009832
1262290
2019664
1767206
198.2805132

198.28. *Ans.*

10. Divide $31.40 among 6 men and 11 youths, giving a youth 0.525 of a man's share. What is each man's share?

0.525
11
5.775
6
11.775

2.66
11775)31400.0
23550
78500
70650
78500
70650
7850

$2.67. *Ans.*

11. Four men together paid $20,000 for some land. The first puts in $2350, the second $5820.35, the third $7640.75. How much must the fourth man pay?

$2350.
5820.35
7640.75
$15,811.10

$20,000.
15,811.10
$4,188.90 *Ans.*

12. What will be the cost of uniforms for a base-ball nine at $2.87 for each uniform?

$2.87
9
$25.83 *Ans.*

13. At $15.87 a ton, what will be the value of 637 tons of hay?

$15.87
637
11109
4761
9522
$10,109.19 *Ans.*

14. If peaches are worth $1.25 a basket, and it takes 3 dozen for a basket, what is the value of 2892 dozen peaches?

3)2892
964
1.25
4820
1928
964
1205.00
$1205. *Ans.*

15. If 964 baskets of peaches are sold for $1301.40, what is the price per basket?

1.35
964)1301.40
964
3374
2892
4820
4820
$1.35. *Ans.*

16. If 324 men contribute together $2647.08, what is the contribution of each?

8.17
324)2647.08
2592
550
324
2268
2268
$8.17. *Ans.*

17. A boy picks blueberries in a pasture, giving to the owner of the pasture for the privilege 1 quart out of every 8 quarts. In 2 days he picks 48 quarts, and sells his share of the berries for $3.78. What did he get a quart?

8)48 48
6 6
42

0.09
42)3.78
378
$0.09. *Ans.*

18. If 150 men work on a railroad at the same price per day, and if, at the end of the week, they all together receive $1575, what price per day does each man receive?

10.5
15$\cancel{0}$)157$\cancel{5}$
15
75
75

6)10.50
1.75
$1.75. *Ans.*

19. If a kite-string is 213.86 feet long, and the kite breaks away and carries off 94.38 feet of the string, how much will be left? How much more must be bought to make up 1000 feet?

213.86
94.38
119.48 *Ans.*

1000.
119.48
880.52 *Ans.*

20. At $9.17 a barrel, how many barrels of flour can be bought for $876.35, and how much money will be left over?

95
$917)$87635
8253
5105
4585
520
95, and $5.20 over. *Ans.*

Ex. 60. Page 96.

1. Find the length in inches of the circumference of a circle if the diameter is 6 inches.

3.1416
6
18.8496 *Ans.*

2. Find the length in inches of the circumference of a circle if the diameter is 17 inches.

3.1416
17
219912
31416
53.4072 *Ans.*

3. If a carriage wheel is 4 feet in diameter, what is its circumference in feet?

3.1416
4
12.5664 *Ans.*

4. If the carriage wheel in Example 3 rolls on the ground without slipping, how many feet will it go in turning 27 times?

12.5664
27
879648
251328
339.2928 *Ans.*

5. How many times will the carriage wheel in Example 3 turn in going 1160 feet?

92.309.....
125664)11600000
1130976
290240
251328
389120
376992
1212800
1130976

92.309..... *Ans.*

6. Find the diameter in feet of a circle if its circumference is 1000 feet.

318.3.....
31416)100000000
94248
57520
31416
261040
251328
97120
94248
2872
318.3..... *Ans.*

7. Find the diameter in feet of a wheel which revolves 19.5 times in going 253.5 feet.

13
195)2535
195
585
585

4.138.....
31416)130000
125664
43360
31416
119440
94248
251920
251328
592
4.138..... *Ans.*

8. If the circumference of a circle is 198 yards, what is its diameter in yards?

63.025.....
31416)1980000
188496
95040
94248
79200
62832
163680
157080
6600
63.025..... *Ans.*

9. How deep is a well if the wheel, whose diameter is 2 feet, makes 10 revolutions in raising the bucket?

3.1416
2
6.2832
10
62.8320 ft. *Ans.*

10. If a carriage wheel makes 440 revolutions in travelling a mile (5280 feet), what is its diameter in feet?

12
$44\cancel{0})528\cancel{0}$
44
88
88

3.819.....
31416)120000
94248
257520
251328
61920
31416
305040
282744
22296

3.819..... *Ans.*

11. If 1964.52 bushels of corn are to be put into bags holding 2.14 bushels each, how many bags will it take?

918
214)196452
1926
385
214
1712
1712

918. *Ans.*

12. A boy has 3 pieces of twine: one is 58.74 feet long, another is 97.86 feet, and a third 57.26 feet. How long a kite-string can he make, making no allowance for knots?

58.74
97.86
57.26
213.86 *Ans.*

13. Boys in playing hare and hound run 3.876 miles. The hares drop a piece of paper every 4.75 feet on the average. How many pieces do they drop? A mile is 5280 feet.

5280
3.876
31680
3696
4224
1584
20465.280

4308
475)2046528
1900
1465
1425
4028
3800
220

4308. *Ans.*

14. If a man earns $23.25 a day, how many days will it take him to earn $1964.87?

84.5
2325)196487.0
18600
10487
9300
11870
11625
245

84.5. *Ans.*

15. A grain merchant bought corn at 60 cents and rye at 75 a bushel. He bought the same number of bushels of both kinds of grain and paid for both together $607.50. How many bushels of each kind did he buy?

60
75
135

450
135)60750
540
675
675

450. *Ans.*

16. When potatoes are worth $0.77 per bushel, and corn $1.10, how many bushels of corn should a farmer receive in exchange for 50 bushels of potatoes?

$0.77
50
$38.50

$11\cancel{0})385\cancel{0}$
35

35. *Ans.*

17. How many gallons of 231 cubic inches are contained in a cubic foot (1728 cubic inches)?

7.48
231)1728.0
1617
1110
924
1860
1848
12

7.48. *Ans.*

18. How many cubic feet are contained in a bushel, a bushel containing 2150.42 cubic inches?

1.244
1728)2150.42
1728
4224
3456
7682
6912
7700
6912

1.244. *Ans.*

19. For $7624.13 how many tons of hay can be bought at $18.75 a ton?

406.62
1875)762413.0
7500
12413
11250
11630
11250
3800
3750
50

406.62. *Ans.*

20. The large wheel of a bicycle is 14.37 feet around. How many times will it turn in going a mile (5280 feet)?

367.4
1437)528000.0
4311
9690
8622
10680
10059
6210
5748

367.4. *Ans.*

Ex. 61. Page 100.

1. Find the prime factors of 32; 48; 56; 60; 75; 63; 92; 44; 88; 72; 84; 85.

$$\begin{array}{r|r} 2 & \underline{32} \\ 2 & \underline{16} \\ 2 & \underline{8} \\ 2 & \underline{4} \\ & 2 \end{array}$$

2^5. *Ans.*

$$\begin{array}{r|r} 2 & \underline{48} \\ 2 & \underline{24} \\ 2 & \underline{12} \\ 2 & \underline{6} \\ & 3 \end{array}$$

$2^4 \times 3$. *Ans.*

$$\begin{array}{r|r} 2 & \underline{56} \\ 2 & \underline{28} \\ 2 & \underline{14} \\ & 7 \end{array}$$

$2^3 \times 7$. *Ans.*

$$\begin{array}{r|r} 2 & \underline{60} \\ 2 & \underline{30} \\ 3 & \underline{15} \\ & 5 \end{array}$$

$2^2 \times 3 \times 5$. *Ans.*

$$\begin{array}{r|r} 3 & \underline{75} \\ 5 & \underline{25} \\ & 5 \end{array}$$

3×5^2. *Ans.*

$$\begin{array}{r|r} 3 & \underline{63} \\ 3 & \underline{21} \\ & 7 \end{array}$$

$3^2 \times 7$. *Ans.*

$$\begin{array}{r|r} 2 & \underline{92} \\ 2 & \underline{46} \\ & 23 \end{array}$$

$2^2 \times 23$. *Ans.*

$$\begin{array}{r|r} 2 & \underline{44} \\ 2 & \underline{22} \\ & 11 \end{array}$$

$2^2 \times 11$. *Ans.*

$$\begin{array}{r|r} 2 & \underline{88} \\ 2 & \underline{44} \\ 2 & \underline{22} \\ & 11 \end{array}$$

$2^3 \times 11$. *Ans.*

$$\begin{array}{r|r} 2 & \underline{72} \\ 2 & \underline{36} \\ 2 & \underline{18} \\ 3 & \underline{9} \\ & 3 \end{array}$$

$2^3 \times 3^2$. *Ans.*

$$\begin{array}{r|r} 2 & \underline{84} \\ 2 & \underline{42} \\ 3 & \underline{21} \\ & 7 \end{array}$$

$2^2 \times 3 \times 7$. *Ans.*

$$\begin{array}{r|r} 5 & \underline{85} \\ & 17 \end{array}$$

5×17. *Ans.*

2. Find the prime factors of 51; 69; 68; 87; 54; 98; 74; 90; 86; 70; 42; 62.

$$\begin{array}{r|r} 3 & \underline{51} \\ & 17 \end{array}$$

3×17. *Ans.*

$$\begin{array}{r|r} 3 & \underline{69} \\ & 23 \end{array}$$

3×23. *Ans.*

$$\begin{array}{r|r} 2 & \underline{68} \\ 2 & \underline{34} \\ & 17 \end{array}$$

$2^2 \times 17$. *Ans.*

$$\begin{array}{r|r} 3 & \underline{87} \\ & 29 \end{array}$$

3×29. *Ans.*

$$\begin{array}{r|r} 2 & \underline{54} \\ 3 & \underline{27} \\ 3 & \underline{9} \\ & 3 \end{array}$$

2×3^3. *Ans.*

$$\begin{array}{r|r} 2 & \underline{98} \\ 7 & \underline{49} \\ & 7 \end{array}$$

2×7^2. *Ans.*

$$\begin{array}{r|r} 2 & \underline{74} \\ & 37 \end{array}$$

2×37. *Ans.*

$$\begin{array}{r|r} 2 & \underline{90} \\ 5 & \underline{45} \\ 3 & \underline{9} \\ & 3 \end{array}$$

$2 \times 5 \times 3^2$. *Ans.*

$$\begin{array}{r|r} 2 & \underline{86} \\ & 43 \end{array}$$

2×43. *Ans.*

$$\begin{array}{r|r} 2 & \underline{70} \\ 5 & \underline{35} \\ & 7 \end{array}$$

$2 \times 5 \times 7$. *Ans.*

$$\begin{array}{r|r} 2 & \underline{42} \\ 3 & \underline{21} \\ & 7 \end{array}$$

$2 \times 3 \times 7$. *Ans.*

$$\begin{array}{r|r} 2 & \underline{62} \\ & 31 \end{array}$$

2×31. *Ans.*

3. Find the prime factors of 112; 140; 132; 216; 162; 176; 252; 240; 360; 384.

$$\begin{array}{r|r} 2 & 112 \\ \hline 2 & 56 \\ \hline 2 & 28 \\ \hline 2 & 14 \\ \hline & 7 \end{array}$$

$2^4 \times 7$. *Ans.*

$$\begin{array}{r|r} 2 & 140 \\ \hline 2 & 70 \\ \hline 5 & 35 \\ \hline & 7 \end{array}$$

$2^2 \times 5 \times 7$. *Ans.*

$$\begin{array}{r|r} 2 & 132 \\ \hline 2 & 66 \\ \hline 3 & 33 \\ \hline & 11 \end{array}$$

$2^2 \times 3 \times 11$. *Ans.*

$$\begin{array}{r|r} 2 & 216 \\ \hline 2 & 108 \\ \hline 2 & 54 \\ \hline 3 & 27 \\ \hline 3 & 9 \\ \hline & 3 \end{array}$$

$2^3 \times 3^3$. *Ans.*

$$\begin{array}{r|r} 2 & 162 \\ \hline 3 & 81 \\ \hline 3 & 27 \\ \hline 3 & 9 \\ \hline & 3 \end{array}$$

2×3^4. *Ans.*

$$\begin{array}{r|r} 2 & 176 \\ \hline 2 & 88 \\ \hline 2 & 44 \\ \hline 2 & 22 \\ \hline & 11 \end{array}$$

$2^4 \times 11$. *Ans.*

$$\begin{array}{r|r} 2 & 252 \\ \hline 2 & 126 \\ \hline 3 & 63 \\ \hline 3 & 21 \\ \hline & 7 \end{array}$$

$2^2 \times 3^2 \times 7$. *Ans.*

$$\begin{array}{r|r} 2 & 240 \\ \hline 2 & 120 \\ \hline 2 & 60 \\ \hline 2 & 30 \\ \hline 3 & 15 \\ \hline & 5 \end{array}$$

$2^4 \times 3 \times 5$. *Ans.*

$$\begin{array}{r|r} 2 & 360 \\ \hline 2 & 180 \\ \hline 2 & 90 \\ \hline 3 & 45 \\ \hline 3 & 15 \\ \hline & 5 \end{array}$$

$2^3 \times 3^2 \times 5$. *Ans.*

$$\begin{array}{r|r} 2 & 384 \\ \hline 2 & 192 \\ \hline 2 & 96 \\ \hline 2 & 48 \\ \hline 2 & 24 \\ \hline 2 & 12 \\ \hline 2 & 6 \\ \hline & 3 \end{array}$$

$2^7 \times 3$. *Ans.*

4. Find the prime factors of 484; 476; 512; 525; 560; 572; 632; 648; 696; 720.

$$\begin{array}{r|r} 2 & 484 \\ \hline 2 & 242 \\ \hline 11 & 121 \\ \hline & 11 \end{array}$$

$2^2 \times 11^2$. *Ans.*

$$\begin{array}{r|r} 2 & 476 \\ \hline 2 & 238 \\ \hline 7 & 119 \\ \hline & 17 \end{array}$$

$2^2 \times 7 \times 17$. *Ans.*

$$\begin{array}{r|r} 2 & 512 \\ \hline 2 & 256 \\ \hline 2 & 128 \\ \hline 2 & 64 \\ \hline 2 & 32 \\ \hline 2 & 16 \\ \hline 2 & 8 \\ \hline 2 & 4 \\ \hline & 2 \end{array}$$

2^9. *Ans.*

$$\begin{array}{r|r} 5 & 525 \\ \hline 5 & 105 \\ \hline 3 & 21 \\ \hline & 7 \end{array}$$

$5^2 \times 3 \times 7$. *Ans.*

2 | 560
2 | 280
2 | 140
2 | 70
5 | 35
7

$2^4 \times 5 \times 7$. *Ans.*

2 | 572
2 | 286
11 | 143
13

$2^2 \times 11 \times 13$. *Ans.*

2 | 632
2 | 316
2 | 158
79

$2^3 \times 79$. *Ans.*

2 | 648
2 | 324
2 | 162
3 | 81
3 | 27
3 | 9
3

$2^3 \times 3^4$. *Ans.*

2 | 696
2 | 348
2 | 174
3 | 87
29

$2^3 \times 3 \times 29$. *Ans.*

2 | 720
2 | 360
2 | 180
2 | 90
3 | 45
3 | 15
5

$2^4 \times 3^2 \times 5$. *Ans.*

5. Find the prime factors of 748; 775; 824; 876; 888; 948; 960; 925; 117; 119.

2 | 748
2 | 374
11 | 187
17

$2^2 \times 11 \times 17$. *Ans.*

5 | 775
5 | 155
31

$5^2 \times 31$. *Ans.*

2 | 824
2 | 412
2 | 206
103

$2^3 \times 103$. *Ans.*

2 | 876
2 | 438
3 | 219
73

$2^2 \times 3 \times 73$. *Ans.*

2 | 888
2 | 444
2 | 222
3 | 111
37

$2^3 \times 3 \times 37$. *Ans.*

2 | 948
2 | 474
3 | 237
79

$2^2 \times 3 \times 79$. *Ans.*

2 | 960
2 | 480
2 | 240
2 | 120
2 | 60
2 | 30
3 | 15
5

$2^6 \times 3 \times 5$. *Ans.*

5 | 925
5 | 185
37

$5^2 \times 37$. *Ans.*

3 | 117
3 | 39
13

$3^2 \times 13$. *Ans.*

7 | 119
17

7×17. *Ans.*

Ex. 62. Page 100.

1. Find the prime factors of 1.05; 12.5; 14.3; 1.65; 19.2; 2.42; 62.4; 27.5.

1.05 = 105 × 0.01.

$$\begin{array}{r|r} 5 & 105 \\ 3 & 21 \\ & 7 \end{array}$$

$5 \times 3 \times 7 \times 0.01$. *Ans.*

12.5 = 125 × 0.1.

$$\begin{array}{r|r} 5 & 125 \\ 5 & 25 \\ & 5 \end{array}$$

$5^3 \times 0.1$. *Ans.*

14.3 = 143 × 0.1.

$$\begin{array}{r|r} 11 & 143 \\ & 13 \end{array}$$

$11 \times 13 \times 0.1$. *Ans.*

1.65 = 165 × 0.01.

$$\begin{array}{r|r} 3 & 165 \\ 5 & 55 \\ & 11 \end{array}$$

$3 \times 5 \times 11 \times 0.01$. *Ans.*

19.2 = 192 × 0.1.

$$\begin{array}{r|r} 2 & 192 \\ 2 & 96 \\ 2 & 48 \\ 2 & 24 \\ 2 & 12 \\ 2 & 6 \\ & 3 \end{array}$$

$2^6 \times 3 \times 0.1$. *Ans.*

2.42 = 242 × 0.01.

$$\begin{array}{r|r} 2 & 242 \\ 11 & 121 \\ & 11 \end{array}$$

$2 \times 11^2 \times 0.01$. *Ans.*

62.4 = 624 × 0.1.

$$\begin{array}{r|r} 2 & 624 \\ 2 & 312 \\ 2 & 156 \\ 2 & 78 \\ 3 & 39 \\ & 13 \end{array}$$

$2^4 \times 3 \times 13 \times 0.1$. *Ans.*

27.5 = 275 × 0.1.

$$\begin{array}{r|r} 5 & 275 \\ 5 & 55 \\ & 11 \end{array}$$

$5^2 \times 11 \times 0.1$. *Ans.*

2. Find the prime factors of 34.3; 5.39; 62.1; 118.8; 1.331; 1.452; 1.584; 92.4.

34.3 = 343 × 0.1.

$$\begin{array}{r|r} 7 & 343 \\ 7 & 49 \\ & 7 \end{array}$$

$7^3 \times 0.1$. *Ans.*

5.39 = 539 × 0.01.

$$\begin{array}{r|r} 7 & 539 \\ 7 & 77 \\ & 11 \end{array}$$

$7^2 \times 11 \times 0.01$. *Ans.*

62.1 = 621 × 0.1.

$$\begin{array}{r|r} 3 & 621 \\ 3 & 207 \\ 3 & 69 \\ & 23 \end{array}$$

$3^3 \times 23 \times 0.1$. *Ans.*

$118.8 = 1188 \times 0.1.$

$$\begin{array}{r|r} 2 & 1188 \\ \hline 2 & 594 \\ \hline 3 & 297 \\ \hline 3 & 99 \\ \hline 3 & 33 \\ \hline & 11 \end{array}$$

$2^2 \times 3^3 \times 11 \times 0.1.$ *Ans.*

$1.331 = 1331 \times 0.001.$

$$\begin{array}{r|r} 11 & 1331 \\ \hline 11 & 121 \\ \hline & 11 \end{array}$$

$11^3 \times 0.001.$ *Ans.*

$1.452 = 1452 \times 0.001.$

$$\begin{array}{r|r} 2 & 1452 \\ \hline 2 & 726 \\ \hline 3 & 363 \\ \hline 11 & 121 \\ \hline & 11 \end{array}$$

$2^2 \times 3 \times 11^2 \times 0.001.$ *Ans.*

$1.584 = 1584 \times 0.001.$

$$\begin{array}{r|r} 2 & 1584 \\ \hline 2 & 792 \\ \hline 2 & 396 \\ \hline 2 & 198 \\ \hline 3 & 99 \\ \hline 3 & 33 \\ \hline & 11 \end{array}$$

$2^4 \times 3^2 \times 11 \times 0.001.$ *Ans.*

$92.4 = 924 \times 0.1.$

$$\begin{array}{r|r} 2 & 924 \\ \hline 2 & 462 \\ \hline 3 & 231 \\ \hline 7 & 77 \\ \hline & 11 \end{array}$$

$2^2 \times 3 \times 7 \times 11 \times 0.1.$ *Ans.*

Ex. 63. Page 102.

1. Find the G.C.M. of 48, 128.

$$\begin{array}{r|rr} 2 & 48 & 128 \\ \hline 2 & 24 & 64 \\ \hline 2 & 12 & 32 \\ \hline 2 & 6 & 16 \\ \hline & 3 & 8 \end{array}$$

$2^4 = 16.$ *Ans.*

2. Find the G.C.M. of 36, 90.

$$\begin{array}{r|rr} 2 & 36 & 90 \\ \hline 3 & 18 & 45 \\ \hline 3 & 6 & 15 \\ \hline & 2 & 5 \end{array}$$

$2 \times 3^2 = 18.$ *Ans.*

3. Find the G.C.M. of 64, 256.

$64 = 2^6.$

$256 = 2^8.$

$2^6 = 64.$ *Ans.*

4. Find the G.C.M. of 24, 105.

$$\begin{array}{r|rr} 3 & 24 & 105 \\ \hline & 8 & 35 \end{array}$$

3. *Ans.*

5. Find the G.C.M. of 125, 600

$$\begin{array}{r|rr} 5 & 125 & 600 \\ \hline 5 & 25 & 120 \\ \hline & 5 & 24 \end{array}$$

$5^2 = 25.$ *Ans.*

6. Find the G. C. M. of 56, 138.

$$\begin{array}{r|rr} 2 & 56 & 138 \\ \hline & 28 & 69 \end{array}$$

2. *Ans.*

7. Find the G. C. M. of 63, 108.

$$\begin{array}{r|rr} 3 & 63 & 108 \\ \hline 3 & 21 & 36 \\ \hline & 7 & 9 \end{array}$$

$3^2 = 9$. *Ans.*

8. Find the G. C. M. of 40, 600.

$$\begin{array}{r|rr} 2 & 40 & 600 \\ \hline 5 & 20 & 300 \\ \hline 2 & 4 & 60 \\ \hline 2 & 2 & 30 \\ \hline & 1 & 15 \end{array}$$

$2^3 \times 5 = 40$. *Ans.*

9. Find the G. C. M. of 65, 91.

$$\begin{array}{r|rr} 13 & 65 & 91 \\ \hline & 5 & 7 \end{array}$$

13. *Ans.*

10. Find the G. C. M. of 39, 273.

$$\begin{array}{r|rr} 3 & 39 & 273 \\ \hline 13 & 13 & 91 \\ \hline & 1 & 7 \end{array}$$

$3 \times 13 = 39$. *Ans.*

11. Find the G. C. M. of 56, 126.

$$\begin{array}{r|rr} 2 & 56 & 126 \\ \hline 7 & 28 & 63 \\ \hline & 4 & 9 \end{array}$$

$2 \times 7 = 14$. *Ans.*

12. Find the G. C. M. of 232, 493.

$$\begin{array}{r|rr} 29 & 232 & 493 \\ \hline & 8 & 17 \end{array}$$

29. *Ans.*

13. Find the G. C. M. of 365, 511.

$$\begin{array}{r|rr} 73 & 365 & 511 \\ \hline & 5 & 7 \end{array}$$

73. *Ans.*

14. Find the G. C. M. of 148, 592.

$$\begin{array}{r|rr} 2 & 148 & 592 \\ \hline 2 & 74 & 296 \\ \hline 37 & 37 & 148 \\ \hline & 1 & 4 \end{array}$$

$2^2 \times 37 = 148$. *Ans.*

15. Find the G. C. M. of 216, 360.

$$\begin{array}{r|rr} 2 & 216 & 360 \\ \hline 2 & 108 & 180 \\ \hline 2 & 54 & 90 \\ \hline 3 & 27 & 45 \\ \hline 3 & 9 & 15 \\ \hline & 3 & 5 \end{array}$$

$2^3 \times 3^2 = 72$. *Ans.*

16. Find the G. C. M. of 279, 403.

$$\begin{array}{r|rr} 31 & 279 & 403 \\ \hline & 9 & 13 \end{array}$$

31. *Ans.*

17. Find the G. C. M. of 294, 378.

$$\begin{array}{r|rr} 2 & 294 & 378 \\ \hline 3 & 147 & 189 \\ \hline 7 & 49 & 63 \\ \hline & 7 & 9 \end{array}$$

$2 \times 3 \times 7 = 42$. *Ans.*

18. Find the G. C. M. of 210, 294.

$$\begin{array}{r|rr} 2 & 210 & 294 \\ \hline 3 & 105 & 147 \\ \hline 7 & 35 & 49 \\ \hline & 5 & 7 \end{array}$$

$2 \times 3 \times 7 = 42$. *Ans.*

19. Find the G. C. M. of 182, 196.

$$\begin{array}{r|rr} 2 & 182 & 196 \\ \hline 7 & 91 & 98 \\ \hline & 13 & 14 \end{array}$$

$2 \times 7 = 14$. *Ans.*

20. Find the G. C. M. of 225, 375.

$$\begin{array}{r|rr} 5 & 225 & 375 \\ \hline 5 & 45 & 75 \\ \hline 3 & 9 & 15 \\ \hline & 3 & 5 \end{array}$$

$5^2 \times 3 = 75$. *Ans.*

21. Find the G. C. M. of 195, 299.

$$\begin{array}{r|rr} 13 & 195 & 299 \\ \hline & 15 & 23 \end{array}$$

13. *Ans.*

22. Find the G. C. M. of 288, 360.

$$\begin{array}{r|rr} 2 & 288 & 360 \\ \hline 2 & 144 & 180 \\ \hline 2 & 72 & 90 \\ \hline 3 & 36 & 45 \\ \hline 3 & 12 & 15 \\ \hline & 4 & 5 \end{array}$$

$2^3 \times 3^2 = 72$. *Ans.*

23. Find the G. C. M. of 133, 152.

$$\begin{array}{r|rr} 19 & 133 & 152 \\ \hline & 7 & 8 \end{array}$$

19. *Ans.*

24. Find the G. C. M. of 23, 111.

$$\begin{array}{r|rr} 1 & 23 & 111 \\ \hline & 23 & 111 \end{array}$$

1. *Ans.*

25. Find the G. C. M. of 352, 384.

$$\begin{array}{r|rr} 2 & 352 & 384 \\ \hline 2 & 176 & 192 \\ \hline 2 & 88 & 96 \\ \hline 2 & 44 & 48 \\ \hline 2 & 22 & 24 \\ \hline & 11 & 12 \end{array}$$

$2^5 = 32$. *Ans.*

26. Find the G. C. M. of 123, 579.

$$\begin{array}{r|rr} 3 & 123 & 579 \\ \hline & 41 & 193 \end{array}$$

3. *Ans.*

27. Find the G. C. M. of 960, 1536.

$$\begin{array}{r|rr} 2 & 960 & 1536 \\ \hline 2 & 480 & 768 \\ \hline 2 & 240 & 384 \\ \hline 2 & 120 & 192 \\ \hline 2 & 60 & 96 \\ \hline 2 & 30 & 48 \\ \hline 3 & 15 & 24 \\ \hline & 5 & 8 \end{array}$$

$2^6 \times 3 = 192$. *Ans.*

28. Find the G. C. M. of 336, 884.

$$\begin{array}{r|rr} 2 & 336 & 884 \\ \hline 2 & 168 & 442 \\ \hline & 84 & 221 \end{array}$$

$2^2 = 4$. *Ans.*

29. Find the G. C. M. of 352, 364.

$$\begin{array}{r|rr} 2 & 352 & 364 \\ \hline 2 & 176 & 182 \\ \hline & 88 & 91 \end{array}$$

$2^2 = 4$. *Ans.*

30. Find the G.C.M. of 1344, 1536.

$$\begin{array}{r|rr} 2 & 1344 & 1536 \\ \hline 2 & 672 & 768 \\ \hline 2 & 336 & 384 \\ \hline 2 & 168 & 192 \\ \hline 2 & 84 & 96 \\ \hline 2 & 42 & 48 \\ \hline 3 & 21 & 24 \\ \hline & 7 & 8 \end{array}$$

$2^6 \times 3 = 192$. *Ans.*

31. Find the G.C.M. of 21, 35, 56.

$$\begin{array}{r|rrr} 7 & 21 & 35 & 56 \\ \hline & 3 & 5 & 8 \end{array}$$

7. *Ans.*

32. Find the G.C.M. of 42, 133, 56.

$$\begin{array}{r|rrr} 7 & 42 & 133 & 56 \\ \hline & 6 & 19 & 8 \end{array}$$

7. *Ans.*

33. Find the G. C. M. of 32, 48, 128.

$$\begin{array}{r|rrr} 2 & 32 & 48 & 128 \\ \hline 2 & 16 & 24 & 64 \\ \hline 2 & 8 & 12 & 32 \\ \hline 2 & 4 & 6 & 16 \\ \hline & 2 & 3 & 8 \end{array}$$

$2^4 = 16$. *Ans.*

34. Find the G.C.M. of 27, 36, 108.

$$\begin{array}{r|rrr} 3 & 27 & 36 & 108 \\ \hline 3 & 9 & 12 & 36 \\ \hline & 3 & 4 & 12 \end{array}$$

$3^2 = 9$. *Ans.*

35. Find the G.C.M. of 96, 48, 60, 108.

$$\begin{array}{r|rrrr} 2 & 96 & 48 & 60 & 108 \\ \hline 2 & 48 & 24 & 30 & 54 \\ \hline 3 & 24 & 12 & 15 & 27 \\ \hline & 8 & 4 & 5 & 9 \end{array}$$

$2^2 \times 3 = 12$. *Ans.*

36. Find the G. C. M. of 33, 297, 198.

$$\begin{array}{r|rrr} 3 & 33 & 297 & 198 \\ \hline 11 & 11 & 99 & 66 \\ \hline & 1 & 9 & 6 \end{array}$$

$3 \times 11 = 33$. *Ans.*

37. Find the G.C.M. of 56, 63, 315.

$$\begin{array}{r|rrr} 7 & 56 & 63 & 315 \\ \hline & 8 & 9 & 45 \end{array}$$

7. *Ans.*

38. Find the G. C. M. of 75, 225, 500.

$$\begin{array}{r|rrr} 5 & 75 & 225 & 500 \\ \hline 5 & 15 & 45 & 100 \\ \hline & 3 & 9 & 20 \end{array}$$

$5^2 = 25$. *Ans.*

39. Find the G. C. M. of 232, 290, 493.

$29\,\underline{|232 \quad 290 \quad 493}$

$8 \quad 10 \quad 17$

29. *Ans.*

40. Find the G. C. M. of 365, 511, 803.

$73\,\underline{|365 \quad 511 \quad 803}$

$5 \quad 7 \quad 11$

73. *Ans.*

Ex. 64. Page 103.

1. Find the G. C. M. of 342, 665.

342)665(1
$\underline{342}$
323)342(1
$\underline{323}$
19)323(17
$\underline{19}$
133
$\underline{133}$

19. *Ans.*

2. Find the G. C. M. of 841, 899.

841)899(1
$\underline{841}$
58)841(14
$\underline{58}$
261
$\underline{232}$
29)58(2
$\underline{58}$

29. *Ans.*

3. Find the G. C. M. of 961, 1178.

961)1178(1
$\underline{961}$
217)961(4
$\underline{868}$
93)217(2
$\underline{186}$
31)93(3
$\underline{93}$

31. *Ans.*

4. Find the G. C. M. of 1243, 1469.

1243)1469(1
$\underline{1243}$
226)1243(5
$\underline{1130}$
113)226(2
$\underline{226}$

113. *Ans.*

5. Find the G. C. M. of 1001, 1287.

1001)1287(1
$\underline{1001}$
286)1001(3
$\underline{856}$
143)286(2
$\underline{286}$

143. *Ans.*

6. Find the G. C. M. of 1131, 2639.

1131)2639(2
$\underline{2262}$
377)1131(3
$\underline{1131}$

377. *Ans.*

7. Find the G. C. M. of 986, 9889.

986)9889(10
$\underline{986}$
29)986(34
$\underline{986}$

29. *Ans.*

8. Find the G. C. M. of 1792, .832.

```
1792)1832(1
     1792
       40)1792(44
          1760
            32)40(1
               32
                8)32(4
                  32
```

8. *Ans.*

9. Find the G. C. M. of 1792, 1847.

```
1792)1847(1
     1792
       55)1792(32
          1760
            32)55(1
               32
               23)32(1
                  23
                   9)23(2
                     18
                      5)9(1
                        5
                        4)5(1
                          4
                          1)4(4
                            4
```

1. *Ans.*

10. Find the G. C. M. of 1517, 1850.

```
1517)1850(1
     1517
      333)1517(4
          1332
           185)333(1
               185
               148)185(1
                   148
                    37)148(4
                       148
```

37. *Ans.*

11. Find the G. C. M. of 3927, 5049.

```
3927)5049(1
     3927
     1122)3927(3
          3366
           561)1122(2
               1122
```

561. *Ans.*

12. Find the G. C. M. of 1287, 1551.

```
1287)1551(1
     1287
      264)1287(4
          1056
           231)264(1
               231
                33)231(7
                   231
```

33. *Ans.*

13. Find the G. C. M. of 1537, 1802.

```
1537)1802(1
     1537
      265)1537(5
          1325
           212)265(1
               212
                53)212(4
                   212
```

53. *Ans.*

14. Find the G. C. M. of 3056, 3629.

```
3056)3629(1
     3056
      573)3056(5
          2865
           191)573(3
               573
```

191. *Ans.*

15. Find the G. C. M. of 2108, 3813.

```
2108)3813(1
     2108
     1705)2108(1
          1705
           403)1705(4
               1612
                 93)403(4
                    372
                     31)93(3
31. Ans.                93
```

16. Find the G. C. M. of 4844, 5536.

```
      4844)5536(1
           4844
            692)4844(7
692. Ans.       4844
```

17. Find the G. C. M. of 696, 1305.

```
      696)1305(1
           696
           609)696(1
               609
                87)609(7
87. Ans.           609
```

18. Find the G. C. M. of 232, 3219.

```
      232)3219(13
          3016
           203)232(1
               203
                29)203(7
29. Ans.           203
```

19. Find the G. C. M. of 949, 1387.

```
      949)1387(1
           949
           438)949(2
               876
                73)438(6
73. Ans.           438
```

20. Find the G. C. M. of 1081, 1311.

```
1081)1311(1
     1081
      230)1081(4
           920
           161)230(1
               161
                69)161(2
                   138
                    23)69(3
23. Ans.               69
```

21. Find the G. C. M. of 2573, 4067.

```
2573)4067(1
     2573
     1494)2573(1
          1494
          1097)1494(1
               1097
                415)1097(2
                     830
                     249)415(1
                         249
                         166
          166)249(1
              166
               83)166(2
83. Ans.          166
```

22. Find the G.C.M. of 105, 16, 405.

105)216(2
210
6)105(17
102
3)6(2
6

3)405
3. *Ans.* 135

23. Find the G.C.M. of 112, 28, 192.

112)128(2
112
16)112(7
112

16)192(12
16. *Ans.* 192

24. Find the G.C.M. of 132, 68, 352.

132)168(1
132
36)132(3
108
24)36(1
24
12)24(2
24

12)352(29
348
4)12(3
4. *Ans.* 12

25. Find the G.C.M. of 198, 209, 495, 660.

198)209(1
198
11)198(18
198

11)495(45 11)660(60
495 660

11. *Ans.*

26. Find the G.C.M. of 146, 219, 365, 730.

146)219(1
146
73)146(2
146

73)365(5 73)730(10
365 730

73. *Ans.*

27. Find the G.C.M. of 246, 612, 924, 378.

246)612(2
492
120)246(2
240
6)120(20
120

6)924 6)378
154 63

6. *Ans.*

Ex. 65. Page 105.

1. Find the L.C.M. of 3, 9, 27, 54.

$$\cancel{3}\quad \cancel{9}\quad \cancel{27}\quad 54$$

54. *Ans.*

2. Find the L.C.M. of 6, 9, 24, 40.

$$\begin{array}{r|rrrr} 3 & \cancel{6} & 9 & 24 & 40 \\ \hline & & 3 & \cancel{8} & 40 \end{array}$$

$3 \times 3 \times 40 = 360$. *Ans.*

3. Find the L.C.M. of 144, 12, 18, 96.

$$\begin{array}{r|rrrr} 2 & 144 & \cancel{12} & \cancel{18} & 96 \\ \hline 2 & 72 & & & 48 \\ \hline 2 & 36 & & & 24 \\ \hline 2 & 18 & & & 12 \\ \hline 3 & 9 & & & 6 \\ \hline & 3 & & & 2 \end{array}$$

$2^4 \times 3 \times 3 \times 2 = 288$. *Ans.*

4. Find the L.C.M. of 3, 8, 12, 22.

$$\begin{array}{r|rrrr} 2 & \cancel{3} & 8 & 12 & 22 \\ \hline 2 & & 4 & 6 & 11 \\ \hline & & 2 & 3 & 11 \end{array}$$

$2 \times 2 \times 2 \times 3 \times 11 = 264$. *Ans.*

5. Find the L.C.M. of 16, 30, 48, 15.

$$\begin{array}{r|rrrr} 2 & \cancel{16} & 30 & 48 & \cancel{15} \\ \hline 3 & & 15 & 24 & \\ \hline & & 5 & 8 & \end{array}$$

$2 \times 3 \times 5 \times 8 = 240$. *Ans.*

6. Find the L.C.M. of 12, 24, 63, 84.

$$\begin{array}{r|rrrr} 2 & \cancel{12} & 24 & 63 & 84 \\ \hline 2 & & 12 & 63 & 42 \\ \hline 3 & & 6 & 63 & \cancel{21} \\ \hline & & 2 & 21 & \end{array}$$

$2 \times 2 \times 3 \times 2 \times 21 = 504$. *Ans.*

7. Find the L.C.M. of 9, 27, 33, 54.

$$\begin{array}{r|rrrr} 3 & \cancel{9} & \cancel{27} & 33 & 54 \\ \hline & & & 11 & 18 \end{array}$$

$3 \times 11 \times 18 = 594$. *Ans.*

8. Find the L.C.M. of 12, 20, 36, 54.

$$\begin{array}{r|rrrr} 2 & \cancel{12} & 20 & 36 & 54 \\ \hline 2 & & 10 & 18 & 27 \\ \hline & & 5 & \cancel{9} & 27 \end{array}$$

$2^2 \times 5 \times 27 = 540$. *Ans.*

9. Find the L.C.M. of 22, 44, 88, 108.

$$\begin{array}{r|rrrr} 2 & \cancel{22} & \cancel{44} & 88 & 108 \\ \hline 2 & & & 44 & 54 \\ \hline & & & 22 & 27 \end{array}$$

$2 \times 2 \times 22 \times 27 = 2376$. *Ans.*

10. Find the L.C.M. of 15, 30, 45, 60.

$$\begin{array}{r|rrrr} 5 & \cancel{15} & \cancel{30} & 45 & 60 \\ \hline 3 & & & 9 & 12 \\ \hline & & & 3 & 4 \end{array}$$

$5 \times 3 \times 3 \times 4 = 180$. *Ans.*

11. Find the L. C. M. of 8, 16, 24, 32.

$$\begin{array}{r|rrrr} 2 & \cancel{8} & \cancel{16} & 24 & 32 \\ \hline 2 & & & 12 & 16 \\ \hline 2 & & & 6 & 8 \\ \hline & & & 3 & 4 \end{array}$$

$2^3 \times 3 \times 4 = 96$. *Ans.*

12. Find the L. C. M. of 13, 15, 26, 39.

$$\begin{array}{r|rrrr} 3 & \cancel{13} & 15 & 26 & 39 \\ \hline & & 5 & 26 & \cancel{13} \end{array}$$

$3 \times 5 \times 26 = 390$. *Ans.*

13. Find the L. C. M. of 7, 17, 51, 119.

$$\begin{array}{r|rrrr} 17 & \cancel{7} & \cancel{17} & 51 & 119 \\ \hline & & & 3 & 7 \end{array}$$

$17 \times 3 \times 7 = 357$. *Ans.*

14. Find the L. C. M. of 8, 6, 28, 32.

$$\begin{array}{r|rrrr} 2 & \cancel{8} & 6 & 28 & 32 \\ \hline 2 & & 3 & 14 & 16 \\ \hline & & 3 & 7 & 8 \end{array}$$

$2^2 \times 3 \times 7 \times 8 = 672$. *Ans.*

15. Find the L. C. M. of 4, 21, 42, 63.

$$\begin{array}{r|rrrr} 2 & 4 & \cancel{21} & 42 & 63 \\ \hline & 2 & & \cancel{21} & 63 \end{array}$$

$2 \times 2 \times 63 = 252$. *Ans.*

16. Find the L. C. M. of 3, 6, 18, 22.

$$\begin{array}{r|rrrr} 2 & \cancel{3} & \cancel{6} & 18 & 22 \\ \hline & & & 9 & 11 \end{array}$$

$2 \times 9 \times 11 = 198$. *Ans.*

17. Find the L. C. M. of 5, 15, 24, 30.

$$\begin{array}{r|rrrr} 2 & \cancel{5} & \cancel{15} & 24 & 30 \\ \hline 3 & & & 12 & 15 \\ \hline & & & 4 & 5 \end{array}$$

$2 \times 3 \times 4 \times 5 = 120$. *Ans.*

18. Find the L. C. M. of 7, 2, 3, 5.

$$7 \quad 2 \quad 3 \quad 5$$

$7 \times 2 \times 3 \times 5 = 210$. *Ans.*

19. Find the L. C. M. of 13, 5, 2, 26.

$$\cancel{13} \quad 5 \quad \cancel{2} \quad 26$$

$5 \times 26 = 130$. *Ans.*

20. Find the L. C. M. of 5, 10, 20, 100.

$$\cancel{5} \quad \cancel{10} \quad \cancel{20} \quad 100$$

100. *Ans.*

21. Find the L. C. M. of 19, 38, 2, 76.

$$\cancel{19} \quad \cancel{38} \quad \cancel{2} \quad 76$$

76. *Ans.*

22. Find the L. C. M. of 3, 9, 27, 81.

$$\cancel{3} \quad \cancel{9} \quad \cancel{27} \quad 81$$

81. *Ans.*

23. Find the L. C. M. of 6, 18, 22, 99.

$$\begin{array}{r|rrrr} 11 & \cancel{6} & 18 & 22 & 99 \\ \hline & & 18 & \cancel{2} & \cancel{9} \end{array}$$

$11 \times 18 = 198$. *Ans.*

24. Find the L. C. M. of 18, 26, 117, 312.

$$\begin{array}{r|rrrr} 2 & 18 & \cancel{26} & 117 & 312 \\ \hline 3 & \cancel{9} & & 117 & 156 \\ \hline 13 & & & 39 & 52 \\ \hline & & & 3 & 4 \end{array}$$

$2 \times 3 \times 13 \times 3 \times 4 = 936$. *Ans.*

25. Find the L. C. M. of 13, 26, 39, 65.

$$\begin{array}{r|rrrr} 13 & \cancel{13} & 26 & 39 & 65 \\ \hline & & 2 & 3 & 5 \end{array}$$

$13 \times 2 \times 3 \times 5 = 390$. *Ans.*

26. Find the L. C. M. of 9, 36, 3, 45.

$$\begin{array}{r|rrrr} 3 & \cancel{9} & 36 & \cancel{3} & 45 \\ \hline 3 & & 12 & & 15 \\ \hline & & 4 & & 5 \end{array}$$

$3^2 \times 4 \times 5 = 180$. *Ans.*

27. Find the L. C. M. of 16, 24, 13, 7.

$$\begin{array}{r|rrrr} 2 & 16 & 24 & 13 & 7 \\ \hline 2 & 8 & 12 & 13 & 7 \\ \hline 2 & 4 & 6 & 13 & 7 \\ \hline & 2 & 3 & 13 & 7 \end{array}$$

$2^4 \times 3 \times 13 \times 7 = 4368$. *Ans.*

28. Find the L. C. M. of 5, 9, 14, 96, 128.

$$\begin{array}{r|rrrrr} 2 & 5 & 9 & 14 & 96 & 128 \\ \hline 2 & 5 & 9 & 7 & 48 & 64 \\ \hline 2 & 5 & 9 & 7 & 24 & 32 \\ \hline 2 & 5 & 9 & 7 & 12 & 16 \\ \hline 2 & 5 & 9 & 7 & 6 & 8 \\ \hline & 5 & 9 & 7 & \cancel{3} & 4 \end{array}$$

$2^5 \times 5 \times 9 \times 7 \times 4 = 40{,}320$. *Ans.*

29. Find the L. C. M. of 32, 36, 49, 56, 42.

$$\begin{array}{r|rrrrr} 2 & 32 & 36 & 49 & 56 & 42 \\ \hline 2 & 16 & 18 & 49 & 28 & 21 \\ \hline 7 & 8 & 9 & 49 & 28 & 21 \\ \hline & 8 & 9 & 7 & \cancel{4} & \cancel{3} \end{array}$$

$2^2 \times 7 \times 8 \times 9 \times 7 = 14{,}112$. *Ans.*

30. Find the L. C. M. of 20, 24, 25, 27, 45.

$$\begin{array}{r|rrrrr} 2 & 20 & 24 & 25 & 27 & 45 \\ \hline 2 & 10 & 12 & 25 & 27 & 45 \\ \hline 5 & \cancel{5} & 6 & 25 & 27 & 45 \\ \hline 3 & & 6 & 5 & 27 & \cancel{9} \\ \hline & & 2 & 5 & 9 & \end{array}$$

$2^2 \times 5 \times 3 \times 2 \times 5 \times 9 = 5400$. *Ans.*

31. Find the L. C. M. of 28, 30, 32, 36, 42.

$$\begin{array}{r|rrrrr} 2 & 28 & 30 & 32 & 36 & 42 \\ \hline 2 & 14 & 15 & 16 & 18 & 21 \\ \hline 3 & \cancel{7} & 15 & 8 & 9 & 21 \\ \hline & & 5 & 8 & 3 & 7 \end{array}$$

$2^2 \times 3 \times 5 \times 8 \times 3 \times 7 = 10{,}080$. *Ans.*

32. Find the L. C. M. of 35, 40, 42, 49, 28.

$$\begin{array}{r|rrrrr} 2 & 35 & 40 & 42 & 49 & 28 \\ \hline 7 & 35 & 20 & 21 & 49 & 14 \\ \hline & \cancel{5} & 20 & 3 & 7 & \cancel{2} \end{array}$$

$2 \times 7 \times 20 \times 3 \times 7 = 5880$. *Ans.*

33. Find the L. C. M. of 14, 18, 21, 32, 28.

$$\begin{array}{r|rrrrr} 2 & \cancel{14} & 18 & 21 & 32 & 28 \\ \hline 2 & & 9 & 21 & 16 & 14 \\ \hline 3 & & 9 & 21 & 8 & \cancel{7} \\ \hline & & 3 & 7 & 8 & \end{array}$$

$2^2 \times 3 \times 3 \times 7 \times 8 = 2016$. *Ans.*

34. Find the L. C. M. of 24, 27, 2, 36, 56.

$$\begin{array}{r|rrrrr} 2 & 24 & 27 & 32 & 36 & 56 \\ \hline 2 & 12 & 27 & 16 & 18 & 28 \\ \hline 2 & 6 & 27 & 8 & \cancel{9} & 14 \\ \hline & \cancel{3} & 27 & 4 & & 7 \end{array}$$

$2^3 \times 27 \times 4 \times 7 = 6048$. *Ans.*

35. Find the L. C. M. of 21, 24, 27, 28, 35.

$$\begin{array}{r|rrrrr} 2 & 21 & 24 & 27 & 28 & 35 \\ \hline 2 & 21 & 12 & 27 & 14 & 35 \\ \hline 3 & 21 & 6 & 27 & \cancel{7} & 35 \\ \hline & \cancel{7} & 2 & 9 & & 35 \end{array}$$

$2^2 \times 3 \times 2 \times 9 \times 35 = 7560$. *Ans.*

36. Find the L. C. M. of 28, 32, 56, 72, 96.

$$\begin{array}{r|rrrrr} 2 & \cancel{28} & \cancel{32} & 56 & 72 & 96 \\ \hline 2 & & & 28 & 36 & 48 \\ \hline 2 & & & 14 & 18 & 24 \\ \hline 3 & & & 7 & 9 & 12 \\ \hline & & & 7 & 3 & 4 \end{array}$$

$2^3 \times 3 \times 7 \times 3 \times 4 = 2016$. *Ans.*

Ex. 66. Page 107.

1. Find the L. C. M. of 510 and 95.

$$\begin{array}{l} 510)595(1 \\ \underline{510} \\ 85)510(6 \\ \underline{510} \\ 85)\underline{595} \\ 7 \times 510 = 3570. \end{array}$$

Ans.

2. Find the L. C. M. of 217 and 43.

$$\begin{array}{l} 217)643(2 \\ \underline{434} \\ 209)217(1 \\ \underline{209} \\ 8)209(26 \\ \underline{208} \\ 1)8(8 \\ \underline{8} \\ 1)\underline{217} \\ 217 \times 643 = 139{,}531. \end{array}$$

Ans.

3. Find the L. C. M. of 308 and 506.

$$\begin{array}{l} 308)506(1 \\ \underline{308} \\ 198)308(1 \\ \underline{198} \\ 110)198(1 \\ \underline{110} \\ 88)110(1 \\ \underline{88} \\ 22)88(4 \\ \underline{88} \\ 22)\underline{506} \\ 23 \times 308 = 7084. \end{array}$$

Ans.

4. Find the L.C.M. of 296 and 407.

296)407(1
296
111)296(2
222
74)111(1
74
37)74(2
74

37)407
11 × 296 = 3256. *Ans.*

5. Find the L.C.M. of 275 and 645.

275)645(2
550
95)275(2
190
85)95(1
85
10)85(8
80
5)10(2
10

5)645
129 × 275 = 35,475. *Ans.*

6. Find the L.C.M. of 468 and 923.

468)923(1
468
455)468(1
455
13)455(35
455

13)923
71 × 468 = 33,228. *Ans.*

7. Find the L.C.M. of 187 and 255.

187)255(1
187
68)187(2
136
51)68(1
51
17)51(3
51

17)255
15 × 187 = 2805. *Ans.*

8. Find the L.C.M. of 663 and 1261.

663)1261(1
663
598)663(1
598
65)598(9
585
13)65(5
65

13)663
97 × 663 = 64,311. *Ans.*

9. Find the L.C.M. of 255 and 357.

255)357(1
255
102)255(2
204
51)102(2
102

51)255
5 × 357 = 1785. *Ans.*

10. Find the L. C. M. of 432 and 840.

432) 840 (1
432
408) 432 (1
408
24) 408 (17
408

24) 840
35 × 432 = 15,120. *Ans.*

11. Find the L. C. M. of 949 and 2920.

949) 2920 (3
2847
73) 949 (13
949

73) 949
13 × 2920 = 37,960. *Ans.*

12. Find the L. C. M. of 1247 and 1769.

1247) 1769 (1
1247
522) 1247 (2
1044
203) 522 (2
406
116) 203 (1
116
87) 116 (1
87
29) 87 (3
87

29) 1769
61 × 1247 = 76,067. *Ans.*

Ex. 67. Page 107.

1. A farmer owns 132 acres of wood-land, and 99 acres of pasture; he wishes to divide them into equal lots of the largest possible size. How many lots will there be, and what number of acres in each one?

$$\begin{array}{r|rr} 3 & 132 & 99 \\ \hline 11 & 44 & 33 \\ \hline & 4 & 3 \end{array}$$

$$\left.\begin{array}{l} 4 + 3 = 7 \text{ lots,} \\ 3 \times 11 = 33 \text{ acres.} \end{array}\right\} \textit{Ans.}$$

2. A merchant has 75 yards of one kind of silk, 225 of a second, and 200 of a third; if he cut them into dress patterns of equal size, what is the largest number of yards which each pattern can contain?

$$\begin{array}{r|rrr} 5 & 75 & 225 & 200 \\ \hline 5 & 15 & 45 & 40 \\ \hline & 3 & 9 & 8 \end{array}$$

$5^2 = 25$. *Ans.*

3. Simeon Jones has 260 bushels of rye, 384 of oats, and 416 of wheat. He sends his grain to market in bags of equal size. What is the greatest number of bushels which each bag can hold, provided there is no mixture of the different kinds of grain?

$$\begin{array}{r|rrr} 2 & 260 & 384 & 416 \\ \hline 2 & 130 & 192 & 208 \\ \hline & 65 & 96 & 104 \end{array}$$

$2^2 = 4$. *Ans.*

4. What width of carpet will fit three rooms, the first 15 feet wide, the second 21 feet, and the third 33 feet?

$$\begin{array}{r|rrr} 3 & 15 & 21 & 33 \\ \hline & 5 & 7 & 11 \end{array}$$

3 ft. *Ans.*

5. A milkman has four different measures, holding 2, 3, 5, and 6 quarts respectively. What is the smallest vessel that can be exactly filled by each of them?

$$\cancel{2} \quad \cancel{3} \quad 5 \quad 6$$

$5 \times 6 = 30$ qts. *Ans.*

6. Find the length of the greatest line that exactly measures the sides of an enclosure 216 yards long and 111 broad.

$$\begin{array}{r|rr} 3 & 216 & 111 \\ \hline & 72 & 37 \end{array}$$

3 yds. *Ans.*

7. Find the contents of the smallest vessel that may be filled by using a 4-quart, a 5-quart, or a 6-quart measure.

$$\begin{array}{r|rrr} 2 & 4 & 5 & 6 \\ \hline & 2 & 5 & 3 \end{array}$$

$2 \times 2 \times 5 \times 3 = 60$ qts. *Ans.*

8. Two apprentices carry 1147 and 961 ivory balls, respectively, from the workshop to the showroom. The balls are carried in baskets of equal size, which are filled and emptied several times. How many balls in a basketful?

$$\begin{array}{l} 961)1147(1 \\ \quad\;\; \underline{961} \\ \quad\;\; 186)961(5 \\ \qquad\qquad \underline{930} \\ \qquad\qquad\; 31)186(6 \\ \qquad\qquad\qquad\; \underline{186} \end{array}$$

31. *Ans.*

9. Find the shortest distance that three lines, 8 feet, 9 feet, and 12 feet long will exactly measure.

$$\begin{array}{r|rrr} 2 & 8 & 9 & 12 \\ \hline 2 & 4 & 9 & 6 \\ \hline & 2 & 9 & \cancel{3} \end{array}$$

$2 \times 2 \times 2 \times 9 = 72$ ft. *Ans.*

Ex. 68. Page 109.

1. $\dfrac{9 \times \overset{\cancel{3}}{\cancel{18}} \times \overset{2}{\cancel{24}}}{\cancel{12} \times \cancel{3} \times \cancel{6}} = 9 \times 2 = 18.$ *Ans.*

2. $\dfrac{\overset{3}{\cancel{15}} \times \overset{3}{\cancel{36}} \times \overset{3}{\cancel{27}}}{\cancel{9} \times \cancel{12} \times \cancel{5}} = 3 \times 3 \times 3 = 27.$ *Ans.*

3. $\dfrac{\cancel{12}\times\overset{2}{\cancel{6}}\times\overset{5}{\cancel{25}}}{\cancel{5}\times\cancel{12}\times\cancel{3}}=2\times 5=10.$ *Ans.*

4. $\dfrac{19\times\overset{\cancel{3}}{\cancel{27}}\times\overset{2}{\cancel{30}}}{\cancel{9}\times\cancel{15}\times\cancel{3}}=19\times 2=38.$ *Ans.*

$\dfrac{\overset{\cancel{3}}{\cancel{45}}\times\overset{2}{\cancel{16}}\times 9}{\cancel{8}\times\cancel{15}\times\cancel{3}}=2\times 9=18.$ *Ans.*

6. $\dfrac{\overset{2}{\cancel{32}}\times\overset{7}{\cancel{49}}\times\overset{2}{\cancel{6}}}{\cancel{3}\times\cancel{16}\times\cancel{7}}=2\times 7\times 2=28.$ *Ans.*

7. $\dfrac{\overset{\cancel{12}}{\overset{\cancel{144}}{\cancel{1728}}}}{\cancel{12}\times\cancel{12}\times\cancel{12}}=1.$ *Ans.*

8. $\dfrac{\overset{5}{\cancel{25}}\times\cancel{6}\times\overset{\cancel{7}}{\cancel{28}}}{\cancel{5}\times\cancel{4}\times\underset{\cancel{7}}{\cancel{35}}}=5.$ *Ans.*

9. $\dfrac{\cancel{6}\times\overset{3}{\overset{\cancel{6}}{\cancel{54}}}\times\cancel{7}\times\overset{3}{\cancel{24}}}{\cancel{7}\times\cancel{8}\times\cancel{9}\times\underset{\cancel{2}}{\cancel{12}}}=3\times 3=9.$ *Ans.*

10. $\dfrac{\overset{\cancel{8}}{\cancel{64}}\times\overset{5}{\cancel{105}}\times\cancel{12}}{\cancel{21}\times\cancel{12}\times\cancel{8}\times\cancel{8}}=5.$ *Ans.*

11. $\dfrac{\overset{3}{\cancel{39}}\times\overset{3}{\overset{\cancel{9}}{\cancel{18}}}\times\cancel{9}}{\cancel{13}\times\underset{\cancel{3}}{\cancel{27}}\times\cancel{2}}=3\times 3=9.$ *Ans.*

12. $\dfrac{\overset{2}{\cancel{50}}\times\overset{\cancel{3}}{\cancel{9}}\times\overset{7}{\cancel{84}}}{\cancel{12}\times\cancel{3}\times\underset{\cancel{25}}{\cancel{75}}}=2\times 7=14.$ *Ans.*

13. $$\frac{\overset{3}{\cancel{144}} \times \overset{3}{\cancel{81}} \times \cancel{2}}{\cancel{27} \times \underset{\cancel{2}}{\cancel{96}}} = 9.$$ *Ans.*

14. $$\frac{\overset{25}{\cancel{625}} \times \overset{\cancel{3}}{\cancel{9}}}{\underset{\cancel{3}}{\cancel{75}} \times \cancel{3}} = 25.$$ *Ans.*

15. $$\frac{\overset{5}{\cancel{75}} \times \cancel{9} \times \overset{8}{\cancel{96}}}{\cancel{12} \times \cancel{15} \times \cancel{9}} = 8 \times 5 = 40.$$ *Ans.*

16. $$\frac{\overset{3}{\cancel{87}} \times \overset{3}{\cancel{15}} \times \cancel{9}}{\cancel{5} \times \cancel{9} \times \cancel{29}} = 3 \times 3 = 9.$$ *Ans.*

17. $$\frac{\overset{7}{\overset{\cancel{21}}{\cancel{84}}} \times \overset{7}{\cancel{91}} \times \cancel{8} \times \cancel{20}}{\underset{\cancel{4}}{\cancel{32}} \times \underset{\cancel{20}}{\cancel{60}} \times \cancel{13}} = 7 \times 7 = 49.$$ *Ans.*

18. $$\frac{\overset{13}{\cancel{169}} \times \overset{\cancel{14}}{\cancel{196}} \times \overset{2}{\overset{\cancel{4}}{\cancel{16}}}}{\underset{\cancel{2}}{\cancel{26}} \times \cancel{14} \times \underset{\cancel{4}}{\cancel{56}}} = 13 \times 2 = 26.$$ *Ans.*

19. $$\frac{\overset{2}{\overset{\cancel{4}}{\cancel{60}}} \times \cancel{9} \times \overset{10}{\overset{\cancel{30}}{\cancel{90}}} \times \cancel{7}}{\underset{\underset{\cancel{7}}{\cancel{21}}}{\cancel{42}} \times \cancel{27} \times \underset{\cancel{3}}{\cancel{15}}} = 2 \times 10 = 20.$$ *Ans.*

20. $$\frac{\overset{1}{\cancel{13}} \times \overset{1}{\cancel{19}} \times \overset{1}{\cancel{17}} \times \overset{1}{\cancel{20}}}{\cancel{17} \times \underset{\cancel{13}}{\cancel{260}} \times 4 \times \underset{19}{\cancel{361}}} = \frac{1}{4 \times 19} = \frac{1}{76}.$$ *Ans.*

Ex. 69. Page 110.

1. How many yards of cloth, at $3 a yard, can be bought for 12 tons of hay, at $15 per ton?

$$\frac{\overset{4}{\cancel{12}} \times 15}{\cancel{3}} = 4 \times 15 = 60.\ \textit{Ans.}$$

2. How many pairs of boots, at $4 a pair, can be bought for 40 pounds of butter, at 40 cents per pound?

$$\frac{\overset{10}{\cancel{40}} \times 0.40}{\cancel{4}} = 10 \times 0.40 = 4.\ \textit{Ans.}$$

3. How many jars of lard of 36 pounds each, at 8 cents per pound, must be given for 16 pieces of cloth containing 24 yards each, at 48 cents a yard?

$$\frac{16 \times \overset{4}{\cancel{24}} \times \overset{\cancel{6}}{\cancel{0.48}}}{\underset{\cancel{6}}{\cancel{36}} \times \cancel{0.08}} = 4 \times 16 = 64.\ \textit{Ans.}$$

4. How many coats, at $4 each, can be bought for 32 yards of broadcloth, at $2.50 a yard?

$$\frac{\overset{8}{\cancel{32}} \times 2.50}{\cancel{4}} = 8 \times 2.50 = 20.\ \textit{Ans.}$$

5. A milkman having 30 cows which give on the average 8 quarts each a day, sells the milk at 5 cents per quart. How many pieces of cloth containing 40 yards each, at 12 cents per yard, ought he to receive for the milk of 6 days?

$$\frac{\overset{\cancel{6}}{\cancel{30}} \times \cancel{8} \times 0.05 \times 6}{\underset{\cancel{5}}{\cancel{40}} \times \underset{0.02}{\cancel{0.12}}} = \frac{0.30}{0.02} = 15.\ \textit{Ans.}$$

6. A market gardener sold 16 lots of celery, 120 bunches in each, at 28 cents per bunch; how many 240-pound barrels of sugar, at 8 cents a pound, will the celery pay for?

$$\frac{\overset{8}{\cancel{16}} \times \cancel{120} \times \overset{0.07}{\cancel{0.28}}}{\underset{\cancel{2}}{\cancel{240}} \times \underset{0.02}{\cancel{0.08}}} = \frac{0.56}{0.02} = 28. \textit{ Ans.}$$

7. John Peters sold 9 firkins of butter weighing 78 pounds each, at 25 cents per pound; how many pieces of matting having 45 yards in a piece, at 30 cents per yard, should he receive?

$$\frac{\cancel{9} \times \overset{39}{\cancel{78}} \times \overset{0.05}{\cancel{0.25}}}{\underset{\cancel{5}}{\cancel{45}} \times \underset{0.15}{\cancel{0.30}}} = \frac{1.95}{0.15} = 13. \textit{ Ans.}$$

8. A workman has received for 15 days' work of 7 hours each, 21 dollars. How much would he receive for 19 days' work of 5 hours each?

$$\frac{19 \times \cancel{5} \times \overset{\cancel{3}}{\cancel{21}}}{\underset{\cancel{3}}{\cancel{15}} \times \cancel{7}} = 19. \textit{ Ans.}$$

9. Thirty workmen have made in 9 days 215 yards of wall. At the same rate, how much would 36 workmen make in 15 days?

$$\frac{\overset{\overset{2}{\cancel{4}}}{\cancel{36}} \times \cancel{15} \times 215}{\underset{\cancel{2}}{\cancel{30}} \times \cancel{9}} = 2 \times 215 = 430. \textit{ Ans.}$$

10. A telegraph operator transmits 50 words, averaging 4 letters each, in the space of 5 minutes. At the same rate, how many minutes will be required to send a despatch of 120 words, averaging 5 letters each?

$$\frac{\overset{\overset{3}{\cancel{12}}}{\cancel{120}} \times 5 \times \cancel{5}}{\underset{\cancel{5}}{\cancel{50}} \times \cancel{4}} = 3 \times 5 = 15. \textit{ Ans.}$$

Ex. 70. (*Oral.*) Page 114.

Reduce to whole or mixed numbers :

1. $\frac{15}{3} = 5$.
2. $\frac{17}{9} = 1\frac{8}{9}$.
3. $\frac{18}{8} = 2\frac{2}{8}$.
4. $\frac{26}{12} = 2\frac{2}{12}$.
5. $\frac{38}{5} = 7\frac{3}{5}$.
6. $\frac{48}{12} = 4$.
7. $\frac{19}{7} = 2\frac{5}{7}$.
8. $\frac{29}{6} = 4\frac{5}{6}$.
9. $\frac{56}{9} = 6\frac{2}{9}$.
10. $\frac{13}{4} = 3\frac{1}{4}$.
11. $\frac{14}{8} = 1\frac{6}{8}$.
12. $\frac{12}{9} = 1\frac{3}{9}$.
13. $\frac{9}{2} = 4\frac{1}{2}$.
14. $\frac{25}{5} = 5$.
15. $\frac{14}{12} = 1\frac{2}{12}$.
16. $\frac{28}{7} = 4$.
17. $\frac{30}{2} = 15$.
18. $\frac{35}{6} = 5\frac{5}{6}$.
19. $\frac{13}{4} = 3\frac{1}{4}$.
20. $\frac{37}{10} = 3\frac{7}{10}$.
21. $\frac{40}{3} = 13\frac{1}{3}$.
22. $\frac{45}{11} = 4\frac{1}{11}$.
23. $\frac{23}{6} = 3\frac{5}{6}$.
24. $\frac{70}{11} = 6\frac{4}{11}$.

Ex. 71. Page 114.

1. Reduce $\frac{97}{16}$ to a whole or mixed number.

$$16\overline{)97}$$
$$6\tfrac{1}{16}$$

2. Reduce $\frac{319}{24}$ to a whole or mixed number.

$$24\overline{)319}$$
$$13\tfrac{7}{24}$$

3. Reduce $\frac{415}{17}$ to a whole or mixed number.

$$17\overline{)415}$$
$$24\tfrac{7}{17}$$

4. Reduce $\frac{683}{25}$ to a whole or mixed number.

$$25\overline{)683}$$
$$27\tfrac{8}{25}$$

5. Reduce $\frac{497}{39}$ to a whole or mixed number.

$$39\overline{)497}$$
$$12\tfrac{29}{39}$$

6. Reduce $\frac{498}{47}$ to a whole or mixed number.

$$47\overline{)498}$$
$$10\tfrac{28}{47}$$

7. Reduce $\frac{576}{53}$ to a whole or mixed number.

$$53\overline{)576}$$
$$10\tfrac{46}{53}$$

8. Reduce $\frac{300}{87}$ to a whole or mixed number.

$$87\overline{)300}$$
$$3\tfrac{39}{87}$$

9. Reduce $\frac{397}{78}$ to a whole or mixed number.

$$78\overline{)397}$$
$$5\tfrac{7}{78}$$

10. Reduce $\frac{563}{45}$ to a whole or mixed number.

$$45\overline{)563}$$
$$12\tfrac{23}{45}$$

11. Reduce $\frac{584}{92}$ to a whole or mixed number.

92)584

$6\frac{32}{92}$

12. Reduce $\frac{796}{97}$ to a whole or mixed number.

97)796

$8\frac{20}{97}$

13. Reduce $\frac{847}{109}$ to a whole or mixed number.

109)847

$7\frac{84}{109}$

14. Reduce $\frac{693}{420}$ to a whole or mixed number.

420)693

$1\frac{273}{420}$

15. Reduce $\frac{318}{95}$ to a whole or mixed number.

95)318

$3\frac{33}{95}$

16. Reduce $\frac{417}{89}$ to a whole or mixed number.

89)417

$4\frac{61}{89}$

17. Reduce $\frac{575}{79}$ to a whole or mixed number.

79)575

$7\frac{22}{79}$

18. Reduce $\frac{587}{38}$ to a whole or mixed number.

38)587

$15\frac{17}{38}$

19. Reduce $\frac{1234}{91}$ to a whole or mixed number.

91)1234

$13\frac{51}{91}$

20. Reduce $\frac{3597}{429}$ to a whole or mixed number.

429)3597

$8\frac{165}{429}$

21. Reduce $\frac{12322}{111}$ to a whole or mixed number.

111)12322

$111\frac{1}{111}$

22. Reduce $\frac{5142}{117}$ to a whole or mixed number.

117)5142

$43\frac{111}{117}$

23. Reduce $\frac{360}{13}$ to a whole or mixed number.

13)360

$27\frac{9}{13}$

24. Reduce $\frac{9172}{63}$ to a whole or mixed number.

63)9172

$145\frac{37}{63}$

25. Reduce $\frac{13505}{72}$ to a whole or mixed number.

72)13505

$187\frac{41}{72}$

26. Reduce $\frac{39679}{83}$ to a whole or mixed number.

83)39679

$478\frac{5}{83}$

27. Reduce $\frac{14271}{250}$ to a whole or mixed number.

$$250\underline{)\,14271\quad}$$
$$57\tfrac{21}{250}$$

28. Reduce $\frac{3615}{411}$ to a whole or mixed number.

$$411\underline{)\,3615\quad}$$
$$8\tfrac{327}{411}$$

29. Reduce $\frac{1384}{37}$ to a whole or mixed number.

$$37\underline{)\,1384\quad}$$
$$37\tfrac{15}{37}$$

30. Reduce $\frac{3145}{43}$ to a whole or mixed number.

$$43\underline{)\,3145\quad}$$
$$73\tfrac{6}{43}$$

31. Reduce $\frac{3782}{73}$ to a whole or mixed number.

$$73\underline{)\,3782\quad}$$
$$51\tfrac{59}{73}$$

32. Reduce $\frac{580}{37}$ to a whole or mixed number.

$$37\underline{)\,580\quad}$$
$$15\tfrac{25}{37}$$

Ex. 72. (*Oral.*) Page 115.

Reduce to improper fractions.

1. $4\frac{1}{5} = \frac{21}{5}$.
2. $7\frac{2}{3} = \frac{23}{3}$.
3. $8\frac{1}{2} = \frac{17}{2}$.
4. $9\frac{3}{7} = \frac{66}{7}$.
5. $5\frac{4}{9} = \frac{49}{9}$.
6. $6\frac{3}{7} = \frac{45}{7}$.
7. $12\frac{1}{3} = \frac{37}{3}$.
8. $10\frac{5}{8} = \frac{85}{8}$.
9. $7\frac{4}{8} = \frac{60}{8}$.
10. $3\frac{9}{10} = \frac{39}{10}$.
11. $8\frac{4}{11} = \frac{92}{11}$.
12. $3\frac{8}{12} = \frac{44}{12}$.
13. $11\frac{3}{7} = \frac{80}{7}$.
14. $13\frac{1}{10} = \frac{131}{10}$.
15. $7\frac{8}{13} = \frac{99}{13}$.
16. $9\frac{6}{12} = \frac{114}{12}$.
17. $20\frac{2}{12} = \frac{242}{12}$.
18. $15\frac{1}{3} = \frac{46}{3}$.
19. $25\frac{1}{2} = \frac{51}{2}$.
20. $30\frac{2}{5} = \frac{152}{5}$.
21. $17\frac{3}{10} = \frac{173}{10}$.
22. $40\frac{1}{4} = \frac{161}{4}$.
23. $50\frac{7}{8} = \frac{407}{8}$.
24. $80\frac{2}{3} = \frac{242}{3}$.

25. Change 12 to thirds; 8 to fourths; 7 to fifths; 9 to halves; 12 to ninths; 13 to sixths; 11 to sevenths; 14 to eighths.

$12 \times \frac{3}{3} = \frac{36}{3}$; $7 \times \frac{5}{5} = \frac{35}{5}$; $12 \times \frac{9}{9} = \frac{108}{9}$; $11 \times \frac{7}{7} = \frac{77}{7}$;

$8 \times \frac{4}{4} = \frac{32}{4}$; $9 \times \frac{2}{2} = \frac{18}{2}$; $13 \times \frac{6}{6} = \frac{78}{6}$; $14 \times \frac{8}{8} = \frac{112}{8}$.

Ex. 73. Page 115.

Change to improper fractions:

1. $15\frac{1}{23} = \frac{15 \times 23 + 1}{23} = \frac{346}{23}$.
2. $36\frac{11}{12} = \frac{36 \times 12 + 11}{12} = \frac{443}{12}$.
3. $5\frac{61}{79} = \frac{5 \times 79 + 61}{79} = \frac{456}{79}$.
4. $3\frac{18}{55} = \frac{3 \times 55 + 18}{55} = \frac{183}{55}$

5. $12\frac{15}{61}=\frac{12\times 61+15}{61}=\frac{747}{61}.$

6. $45\frac{3}{12}=\frac{45\times 12+3}{12}=\frac{543}{12}.$

7. $56\frac{7}{15}=\frac{56\times 15+7}{15}=\frac{847}{15}.$

8. $77\frac{3}{17}=\frac{77\times 17+3}{17}=\frac{1312}{17}.$

9. $183\frac{5}{21}=\frac{183\times 21+5}{21}=\frac{3848}{21}.$

10. $72\frac{31}{43}=\frac{72\times 43+31}{43}=\frac{3127}{43}.$

11. $5\frac{27}{160}=\frac{5\times 160+27}{160}=\frac{827}{160}.$

12. $46\frac{5}{126}=\frac{46\times 126+5}{126}=\frac{5801}{126}.$

13. $2\frac{7}{30}=\frac{2\times 30+7}{30}=\frac{67}{30}.$

14. $9\frac{32}{79}=\frac{9\times 79+32}{79}=\frac{743}{79}.$

15. $10\frac{8}{17}=\frac{10\times 17+8}{17}=\frac{178}{17}.$

16. $155\frac{29}{37}=\frac{155\times 37+29}{37}=\frac{5764}{37}.$

17. $17\frac{29}{84}=\frac{17\times 84+29}{84}=\frac{1457}{84}.$

18. $167\frac{37}{56}=\frac{167\times 56+37}{56}=\frac{9389}{56}.$

19. $29\frac{18}{19}=\frac{29\times 19+18}{19}=\frac{569}{19}.$

20. $29\frac{39}{63}=\frac{29\times 63+39}{63}=\frac{1866}{63}.$

21. Change 25 to 94ths; 218 to 23ds; 375 to 87ths.

$25=\frac{25\times 94}{94}=\frac{2350}{94}$; $218=\frac{218\times 23}{23}=\frac{5014}{23}$; $375=\frac{375\times 87}{87}=\frac{32625}{87}.$

Ex. 74. (*Oral.*) Page 117.

Reduce to lowest terms by inspection:

1. $\frac{9}{12}=\frac{3}{4}.$
2. $\frac{15}{20}=\frac{3}{4}.$
3. $\frac{10}{12}=\frac{5}{6}.$
4. $\frac{14}{16}=\frac{7}{8}.$
5. $\frac{12}{15}=\frac{4}{5}.$
6. $\frac{16}{24}=\frac{2}{3}.$
7. $\frac{12}{18}=\frac{2}{3}.$
8. $\frac{11}{22}=\frac{1}{2}.$
9. $\frac{10}{20}=\frac{1}{2}.$
10. $\frac{15}{18}=\frac{5}{6}.$
11. $\frac{7}{14}=\frac{1}{2}.$
12. $\frac{9}{15}=\frac{3}{5}.$
13. $\frac{18}{27}=\frac{2}{3}.$
14. $\frac{16}{20}=\frac{4}{5}.$
15. $\frac{25}{30}=\frac{5}{6}.$
16. $\frac{21}{28}=\frac{3}{4}.$
17. $\frac{18}{24}=\frac{3}{4}.$
18. $\frac{14}{21}=\frac{2}{3}.$
19. $\frac{9}{21}=\frac{3}{7}.$
20. $\frac{21}{27}=\frac{7}{9}.$
21. $\frac{13}{26}=\frac{1}{2}.$
22. $\frac{14}{30}=\frac{7}{15}.$
23. $\frac{25}{50}=\frac{1}{2}.$
24. $\frac{30}{42}=\frac{5}{7}.$
25. $\frac{27}{45}=\frac{3}{5}.$
26. $\frac{24}{56}=\frac{3}{7}.$
27. $\frac{32}{48}=\frac{2}{3}.$
28. $\frac{36}{63}=\frac{4}{7}.$

Ex. 75. Page 117.

1. $\frac{125}{500}$.

$$\begin{array}{r|rr} 25 & 125 & 500 \\ \hline 5 & 5 & 20 \\ \hline & 1 & 4 \end{array}$$

$\frac{1}{4}$. *Ans.*

2. $\frac{144}{192}$.

$$\begin{array}{r|rr} 16 & 144 & 192 \\ \hline 3 & 9 & 12 \\ \hline & 3 & 4 \end{array}$$

$\frac{3}{4}$. *Ans.*

3. $\frac{96}{264}$.

$$\begin{array}{r|rr} 8 & 96 & 264 \\ \hline 3 & 12 & 33 \\ \hline & 4 & 11 \end{array}$$

$\frac{4}{11}$. *Ans.*

4. $\frac{120}{180}$.

$$\begin{array}{r|rr} 4 & 120 & 180 \\ \hline 3 & 30 & 45 \\ \hline 5 & 10 & 15 \\ \hline & 2 & 3 \end{array}$$

$\frac{2}{3}$. *Ans.*

5. $\frac{36}{252}$.

$$\begin{array}{r|rr} 4 & 36 & 252 \\ \hline 9 & 9 & 63 \\ \hline & 1 & 7 \end{array}$$

$\frac{1}{7}$. *Ans.*

6. $\frac{154}{220}$.

$$\begin{array}{r|rr} 2 & 154 & 220 \\ \hline 11 & 77 & 110 \\ \hline & 7 & 10 \end{array}$$

$\frac{7}{10}$. *Ans.*

7. $\frac{48}{128}$.

$$\begin{array}{r|rr} 16 & 48 & 128 \\ \hline & 3 & 8 \end{array}$$

$\frac{3}{8}$. *Ans.*

8. $\frac{130}{234}$.

$$\begin{array}{r|rr} 2 & 130 & 234 \\ \hline 13 & 65 & 117 \\ \hline & 5 & 9 \end{array}$$

$\frac{5}{9}$. *Ans.*

9. $\frac{28}{154}$.

$$\begin{array}{r|rr} 2 & 28 & 154 \\ \hline 7 & 14 & 77 \\ \hline & 2 & 11 \end{array}$$

$\frac{2}{11}$. *Ans.*

10. $\frac{28}{343}$.

$$\begin{array}{r|rr} 7 & 28 & 343 \\ \hline & 4 & 49 \end{array}$$

$\frac{4}{49}$. *Ans.*

11. $\frac{48}{224}$.

$$\begin{array}{r|rr} 16 & 48 & 224 \\ \hline & 3 & 14 \end{array}$$

$\frac{3}{14}$. *Ans.*

12. $\frac{108}{252}$.

$$\begin{array}{r|rr} 4 & 108 & 252 \\ \hline 9 & 27 & 63 \\ \hline & 3 & 7 \end{array}$$

$\frac{3}{7}$. *Ans.*

13. $\frac{78}{416}$.

$$\begin{array}{r|rr} 2 & 78 & 416 \\ \hline 13 & 39 & 208 \\ \hline & 3 & 16 \end{array}$$

$\frac{3}{16}$. *Ans.*

14. $\frac{308}{506}$.

$$\begin{array}{r|rr} 2 & 308 & 506 \\ \hline 11 & 154 & 253 \\ \hline & 14 & 23 \end{array}$$

$\frac{14}{23}$. *Ans.*

15. $\frac{135}{255}$.

$$\begin{array}{r|rr} 5 & 135 & 255 \\ \hline 3 & 27 & 51 \\ \hline & 9 & 17 \end{array}$$

$\frac{9}{17}$. *Ans.*

16. $\frac{147}{189}$.
$$\begin{array}{r|rr} 3 & 147 & 189 \\ \hline 7 & 49 & 63 \\ \hline & 7 & 9 \end{array}$$
$\frac{7}{9}$. *Ans.*

17. $\frac{136}{168}$.
$$\begin{array}{r|rr} 8 & 136 & 168 \\ \hline & 17 & 21 \end{array}$$
$\frac{17}{21}$. *Ans.*

18. $\frac{180}{234}$.
$$\begin{array}{r|rr} 2 & 180 & 234 \\ \hline 9 & 90 & 117 \\ \hline & 10 & 13 \end{array}$$
$\frac{10}{13}$. *Ans.*

19. $\frac{336}{576}$.
$$\begin{array}{r|rr} 16 & 336 & 576 \\ \hline 3 & 21 & 36 \\ \hline & 7 & 12 \end{array}$$
$\frac{7}{12}$. *Ans.*

20. $\frac{47}{53}$. *Ans.*

21. $\frac{63}{217}$.
$$\begin{array}{r|rr} 7 & 63 & 217 \\ \hline & 9 & 31 \end{array}$$
$\frac{9}{31}$. *Ans.*

22. $\frac{196}{324}$.
$$\begin{array}{r|rr} 4 & 196 & 324 \\ \hline & 49 & 81 \end{array}$$
$\frac{49}{81}$. *Ans.*

23. $\frac{384}{416}$.
$$\begin{array}{r|rr} 8 & 384 & 416 \\ \hline 4 & 48 & 52 \\ \hline & 12 & 13 \end{array}$$
$\frac{12}{13}$. *Ans.*

24. $\frac{209}{253}$.
$$\begin{array}{r|rr} 11 & 209 & 253 \\ \hline & 19 & 23 \end{array}$$
$\frac{19}{23}$. *Ans.*

25. $\frac{330}{660}$.
$$\begin{array}{r|rr} 330 & 330 & 660 \\ \hline & 1 & 2 \end{array}$$
$\frac{1}{2}$. *Ans.*

26. $\frac{128}{256}$.
$$\begin{array}{r|rr} 128 & 128 & 256 \\ \hline & 1 & 2 \end{array}$$
$\frac{1}{2}$. *Ans.*

27. $\frac{256}{1280}$.
$$\begin{array}{r|rr} 256 & 256 & 1280 \\ \hline & 1 & 5 \end{array}$$
$\frac{1}{5}$. *Ans.*

28. $\frac{252}{288}$.
$$\begin{array}{r|rr} 4 & 252 & 288 \\ \hline 9 & 63 & 72 \\ \hline & 7 & 8 \end{array}$$
$\frac{7}{8}$. *Ans.*

29. $\frac{365}{511}$.
```
365)511(1
    365
    146)365(2
        292
         73)146(2
            146
```
$$\begin{array}{r|rr} 73 & 365 & 511 \\ \hline & 5 & 7 \end{array}$$
$\frac{5}{7}$. *Ans.*

30. $\frac{775}{1800}$.
$$\begin{array}{r|rr} 25 & 775 & 1800 \\ \hline & 31 & 72 \end{array}$$
$\frac{31}{72}$. *Ans.*

31. $\frac{144}{960}$.
$$\begin{array}{r|rr} 16 & 144 & 960 \\ \hline 3 & 9 & 60 \\ \hline & 3 & 20 \end{array}$$
$\frac{3}{20}$. *Ans.*

32. $\frac{198}{297}$.

$$\begin{array}{r|rr} 9 & 198 & 297 \\ \hline 11 & 22 & 33 \\ \hline & 2 & 3 \end{array}$$

$\frac{2}{3}$. *Ans.*

33. $\frac{315}{745}$.

$$\begin{array}{r|rr} 5 & 315 & 745 \\ \hline & 63 & 149 \end{array}$$

$\frac{63}{149}$. *Ans.*

34. $\frac{225}{450}$.

$$\begin{array}{r|rr} 225 & 225 & 450 \\ \hline & 1 & 2 \end{array}$$

$\frac{1}{2}$. *Ans.*

35. $\frac{154}{220}$.

$$\begin{array}{r|rr} 2 & 154 & 220 \\ \hline 11 & 77 & 110 \\ \hline & 7 & 10 \end{array}$$

$\frac{7}{10}$. *Ans.*

36. $\frac{118}{121}$. *Ans.*

37. $\frac{492}{744}$.

$$\begin{array}{r|rr} 4 & 492 & 744 \\ \hline 3 & 123 & 186 \\ \hline & 41 & 62 \end{array}$$

$\frac{41}{62}$. *Ans.*

38. $\frac{55}{121}$.

$$\begin{array}{r|rr} 11 & 55 & 121 \\ \hline & 5 & 11 \end{array}$$

$\frac{5}{11}$. *Ans.*

39. $\frac{744}{906}$.

$$\begin{array}{r|rr} 2 & 744 & 906 \\ \hline 3 & 372 & 453 \\ \hline & 124 & 151 \end{array}$$

$\frac{124}{151}$. *Ans.*

40. $\frac{505}{707}$.

$$\begin{array}{r|rr} 101 & 505 & 707 \\ \hline & 5 & 7 \end{array}$$

$\frac{5}{7}$. *Ans.*

41. $\frac{420}{864}$.

$$\begin{array}{r|rr} 4 & 420 & 864 \\ \hline 3 & 105 & 216 \\ \hline & 35 & 72 \end{array}$$

$\frac{35}{72}$. *Ans.*

42. $\frac{882}{1512}$.

$$\begin{array}{r|rr} 2 & 882 & 1512 \\ \hline 9 & 441 & 756 \\ \hline 7 & 49 & 84 \\ \hline & 7 & 12 \end{array}$$

$\frac{7}{12}$. *Ans.*

43. $\frac{630}{882}$.

$$\begin{array}{r|rr} 2 & 630 & 882 \\ \hline 9 & 315 & 441 \\ \hline 7 & 35 & 49 \\ \hline & 5 & 7 \end{array}$$

$\frac{5}{7}$. *Ans.*

44. $\frac{344}{2268}$.

$$\begin{array}{r|rr} 4 & 344 & 2268 \\ \hline & 86 & 567 \end{array}$$

$\frac{86}{567}$. *Ans.*

45. $\frac{168}{224}$.

$$\begin{array}{r|rr} 8 & 168 & 224 \\ \hline 7 & 21 & 28 \\ \hline & 3 & 4 \end{array}$$

$\frac{3}{4}$. *Ans.*

46. $\frac{216}{648}$.

$$\begin{array}{r|rr} 216 & 216 & 648 \\ \hline & 1 & 3 \end{array}$$

$\frac{1}{3}$. *Ans.*

47. $\frac{1242}{2323}$.

$$\begin{array}{r|rr} 23 & 1242 & 2323 \\ \hline & 54 & 101 \end{array}$$

$\frac{54}{101}$. *Ans.*

48. $\frac{2268}{3444}$.

$$\begin{array}{r|rr} 4 & 2268 & 3444 \\ \hline 3 & 567 & 861 \\ \hline 7 & 189 & 287 \\ \hline & 27 & 41 \end{array}$$

$\frac{27}{41}$. *Ans.*

Ex. 76. (*Oral.*) Page 118.

Find the products of:

1. $18 \times \frac{1}{3} = 6$.
2. $25 \times \frac{1}{5} = 5$.
3. $27 \times \frac{8}{9} = 24$.
4. $10 \times \frac{1}{5} = 2$.
5. $24 \times \frac{2}{3} = 16$.
6. $12 \times \frac{1}{4} = 3$.
7. $21 \times \frac{1}{7} = 3$.
8. $30 \times \frac{5}{6} = 25$.
9. $16 \times \frac{1}{8} = 2$.
10. $14 \times \frac{1}{2} = 7$.
11. $20 \times \frac{3}{5} = 12$.
12. $16 \times \frac{1}{4} = 4$.
13. $7 \times \frac{11}{21} = 3\frac{2}{3}$.
14. $16 \times \frac{3}{4} = 12$.
15. $\frac{17}{20} \times 10 = 8\frac{1}{2}$.
16. $\frac{11}{20} \times 12 = 6\frac{3}{5}$.
17. $27 \times \frac{7}{9} = 21$.
18. $\frac{13}{20} \times 15 = 9\frac{3}{4}$.
19. $8 \times \frac{11}{20} = 4\frac{2}{5}$.
20. $16 \times \frac{9}{20} = 7\frac{1}{5}$.
21. $36 \times \frac{5}{12} = 15$.
22. $24 \times \frac{5}{8} = 15$.
23. $32 \times \frac{3}{16} = 6$.
24. $12 \times \frac{5}{16} = 3\frac{3}{4}$.
25. $27 \times \frac{2}{9} = 6$.
26. $18 \times \frac{5}{9} = 10$.
27. $12 \times \frac{7}{9} = 9\frac{1}{3}$.
28. $18 \times \frac{3}{20} = 2\frac{7}{10}$.
29. $25 \times \frac{3}{10} = 7\frac{1}{2}$.
30. $\frac{4}{13} \times 26 = 8$.
31. $\frac{1}{6} \times 9 = 1\frac{1}{2}$.
32. $\frac{7}{15} \times 12 = 5\frac{3}{5}$.
33. $22 \times \frac{5}{33} = 3\frac{1}{3}$.
34. $\frac{5}{21} \times 28 = 6\frac{2}{3}$.
35. $\frac{3}{14} \times 21 = 4\frac{1}{2}$.
36. $\frac{4}{15} \times 35 = 9\frac{1}{3}$.

Ex. 77. (*Oral.*) Page 120.

Find the products of:

1. $\frac{1}{3} \times \frac{3}{5} = \frac{1}{5}$.
2. $\frac{1}{2} \times \frac{8}{9} = \frac{4}{9}$.
3. $\frac{1}{3} \times \frac{9}{8} = \frac{3}{8}$.
4. $\frac{1}{2} \times \frac{3}{8} = \frac{3}{16}$.
5. $\frac{1}{3} \times \frac{3}{7} = \frac{1}{7}$.
6. $\frac{5}{12} \times \frac{7}{9} = \frac{35}{108}$.
7. $\frac{6}{7} \times \frac{7}{4} = 1\frac{1}{2}$.
8. $\frac{4}{25} \times \frac{5}{6} = \frac{2}{15}$.
9. $\frac{7}{30} \times 10 = 2\frac{1}{3}$.
10. $\frac{7}{30} \times \frac{10}{3} = \frac{7}{9}$.
11. $\frac{1}{5} \times \frac{10}{3} = \frac{2}{3}$.
12. $\frac{17}{20} \times \frac{5}{4} = 1\frac{1}{16}$.

Ex. 78. Page 120.

1. $\frac{1}{\cancel{5}} \times \frac{\overset{3}{\cancel{15}}}{19} = \frac{3}{19}$.

2. $\frac{\cancel{2}}{\cancel{3}} \times \frac{\overset{3}{\cancel{9}}}{\cancel{2}} = 3$.

3. $\frac{\cancel{11}}{5} \times \frac{3}{\cancel{11}} \times \frac{2}{7} = \frac{6}{35}$.

4. $\frac{\overset{3}{\cancel{33}}}{\cancel{8}} \times \frac{\overset{\cancel{8}}{\cancel{40}}}{\cancel{11}} \times \frac{2}{\cancel{5}} = 6$.

5. $\frac{\cancel{5}}{\underset{3}{\cancel{9}}} \times \frac{\overset{4}{\cancel{12}}}{25} \times \frac{\overset{2}{\cancel{6}}}{\cancel{5}} = \frac{8}{25}$.

6. $\frac{2}{\cancel{3}} \times \frac{4}{5} \times \frac{\overset{2}{\cancel{6}}}{7} = \frac{16}{35}$.

7. $\dfrac{68}{95}\times\dfrac{2}{5}\times\dfrac{4}{5}=\dfrac{544}{2375}.$

8. $\dfrac{11}{\cancel{3}}\times\dfrac{\cancel{46}}{\cancel{9}}\times\dfrac{\overset{\cancel{3}}{\cancel{27}}}{\cancel{46}}=11.$

9. $\dfrac{\overset{2}{\cancel{12}}}{\cancel{23}}\times\dfrac{\overset{2}{\cancel{46}}}{\cancel{5}}\times\dfrac{\overset{5}{\cancel{25}}}{\cancel{6}}=20.$

10. $\dfrac{\cancel{19}}{\underset{3}{\cancel{9}}}\times\dfrac{\cancel{3}}{7}\times\dfrac{11}{\underset{2}{\cancel{38}}}=\dfrac{11}{42}.$

11. $\dfrac{\overset{\overset{2}{\cancel{10}}}{\cancel{20}}}{\cancel{9}}\times\dfrac{\cancel{9}}{\cancel{2}}\times\dfrac{3}{\underset{5}{\cancel{25}}}=\dfrac{6}{5}=1\tfrac{1}{5}.$

12. $\dfrac{5}{2}\times\dfrac{\cancel{7}}{4}\times\dfrac{13}{\underset{3}{\cancel{21}}}=\dfrac{65}{24}=2\tfrac{17}{24}.$

13. $\dfrac{3}{4}\times\dfrac{\overset{3}{\cancel{15}}}{2}\times\dfrac{3}{\underset{5}{\cancel{25}}}=\dfrac{27}{40}.$

14. $\dfrac{\overset{2}{\cancel{4}}}{\cancel{3}}\times\dfrac{\overset{3}{\cancel{15}}}{\cancel{2}}\times\dfrac{\cancel{3}}{\underset{5}{\cancel{25}}}=\dfrac{6}{5}=1\tfrac{1}{5}.$

15. $\dfrac{\cancel{7}}{\cancel{3}}\times\dfrac{28}{9}\times\dfrac{\overset{10}{\cancel{30}}}{\cancel{7}}=\dfrac{280}{9}=31\tfrac{1}{9}.$

16. $\dfrac{\cancel{7}}{\cancel{18}}\times\dfrac{3}{\underset{\cancel{2}}{\cancel{14}}}\times\dfrac{\overset{\cancel{2}}{\cancel{36}}}{5}=\dfrac{3}{5}.$

17. $\dfrac{\overset{5}{\cancel{25}}}{\underset{\cancel{2}}{\cancel{8}}}\times\dfrac{\cancel{4}}{\cancel{5}}\times\dfrac{\overset{5}{\cancel{10}}}{11}=\dfrac{25}{11}=2\tfrac{3}{11}.$

18. $\dfrac{\cancel{10}}{\cancel{3}}\times\dfrac{\overset{3}{\cancel{9}}}{40}\times\dfrac{9}{\cancel{10}}=\dfrac{27}{40}.$

19. $\dfrac{\overset{2}{\cancel{6}}}{\cancel{19}}\times\dfrac{\cancel{19}}{\underset{\cancel{3}}{\cancel{9}}}\times\dfrac{\overset{7}{\cancel{21}}}{1}=14.$

20. $\dfrac{\cancel{7}}{\cancel{4}}\times\dfrac{\overset{3}{\cancel{15}}}{\underset{\cancel{2}}{\cancel{14}}}\times\dfrac{\overset{\overset{2}{\cancel{4}}}{\cancel{16}}}{\cancel{5}}=6.$

21. $\dfrac{\overset{13}{\cancel{26}}}{3}\times\dfrac{\cancel{2}}{3}\times\dfrac{7}{\underset{\underset{2}{\cancel{4}}}{\cancel{8}}}=\dfrac{91}{18}=5\tfrac{1}{18}.$

22. $\dfrac{16}{1}\times\dfrac{4}{7}\times\dfrac{8}{13}=\dfrac{512}{91}=5\tfrac{57}{91}.$

23. $\dfrac{3}{1}\times\dfrac{\cancel{15}}{2}\times\dfrac{\cancel{11}}{\cancel{15}}\times\dfrac{41}{\cancel{11}}=\dfrac{123}{2}=61\tfrac{1}{2}.$

24. $\dfrac{\cancel{3}}{\cancel{10}}\times\dfrac{\overset{2}{\cancel{6}}}{\cancel{7}}\times\dfrac{8}{\underset{\cancel{3}}{\cancel{9}}}\times\dfrac{\cancel{10}}{\cancel{11}}\times\dfrac{\overset{\cancel{11}}{\cancel{77}}}{1}=16.$

25. $\dfrac{\overset{8}{\cancel{16}}}{\cancel{25}}\times\dfrac{\cancel{4}}{\cancel{3}}\times\dfrac{\overset{\cancel{3}}{\cancel{75}}}{\underset{47}{\cancel{94}}}\times\dfrac{1}{\cancel{4}}=\dfrac{8}{47}.$

26. $\dfrac{\cancel{3}}{\cancel{13}}\times\dfrac{\overset{5}{\cancel{20}}}{\underset{27}{\cancel{81}}}\times\dfrac{\cancel{13}}{\cancel{11}}\times\dfrac{\cancel{11}}{\underset{3}{\cancel{12}}}=\dfrac{5}{81}.$

27. $\frac{11}{\cancel{3}} \times \frac{\overset{13}{\cancel{39}}}{8} \times \frac{15}{1} = \frac{2145}{8} = 268\tfrac{1}{8}.$

28. $\frac{\overset{3}{\cancel{9}}}{\cancel{10}} \times \frac{7}{1} \times \frac{\cancel{11}}{\underset{5}{\cancel{15}}} \times \frac{\overset{96}{\cancel{960}}}{\cancel{11}} = \frac{2016}{5} = 403\tfrac{1}{5}.$

29. $\frac{\cancel{80}}{\cancel{7}} \times \frac{\overset{2}{\cancel{180}}}{11} \times \frac{\cancel{7}}{\cancel{80}} \times \frac{1}{\cancel{90}} = \frac{2}{11}.$

30. $\frac{1}{\cancel{3}} \times \frac{\overset{\cancel{3}}{\cancel{9}}}{\cancel{8}} \times \frac{\cancel{8}}{\cancel{3}} \times \frac{107}{7} = \frac{107}{7} = 15\tfrac{2}{7}.$

31. $\frac{10}{3} \times \frac{\cancel{7}}{\cancel{15}} \times \frac{\cancel{15}}{\cancel{7}} \times \frac{5}{9} = \frac{50}{27} = 1\tfrac{23}{27}.$

32. $\frac{11}{\cancel{3}} \times \frac{\overset{17}{\cancel{51}}}{\underset{\cancel{7}}{\cancel{70}}} \times \frac{\overset{2}{\cancel{20}}}{\cancel{3}} \times \frac{\overset{\cancel{3}}{\cancel{21}}}{25} = \frac{374}{25} = 14\tfrac{24}{25}.$

33. $\frac{1}{\cancel{5}} \times \frac{\cancel{19}}{\cancel{9}} \times \frac{\cancel{9}}{2} \times \frac{\cancel{5}}{\cancel{19}} = \frac{1}{2}.$

34. $\frac{\cancel{2}}{\cancel{5}} \times \frac{\overset{\cancel{3}}{\cancel{15}}}{\cancel{7}} \times \frac{\overset{\cancel{3}}{\cancel{15}}}{\cancel{2}} \times \frac{\overset{3}{\cancel{21}}}{\cancel{5}} \times \frac{8}{\underset{\cancel{3}}{\cancel{9}}} = 24.$

35. $\frac{\cancel{5}}{\cancel{2}} \times \frac{7}{\cancel{9}} \times \frac{\overset{2}{\cancel{4}}}{\cancel{5}} \times \frac{\overset{\cancel{3}}{\cancel{27}}}{\cancel{8}} \times \frac{\overset{2}{\cancel{16}}}{\cancel{3}} = 28.$

36. $\frac{1}{\cancel{7}} \times \frac{2}{\cancel{9}} \times \frac{\overset{\cancel{4}}{\cancel{36}}}{5} \times \frac{\overset{\cancel{3}}{\cancel{21}}}{\cancel{4}} \times \frac{19}{\cancel{3}} = \frac{38}{5} = 7\tfrac{3}{5}.$

37. $\frac{\overset{2}{\cancel{46}}}{\cancel{9}} \times \frac{\overset{\cancel{4}}{\cancel{20}}}{\cancel{23}} \times \frac{\overset{4}{\cancel{36}}}{\cancel{5}} \times \frac{15}{\cancel{29}} \times \frac{\cancel{29}}{\cancel{4}} = 120.$

38. $\frac{\cancel{3}}{\cancel{13}} \times \frac{\overset{\cancel{12}}{\cancel{60}}}{\underset{\underset{9}{\cancel{27}}}{\cancel{81}}} \times \frac{\overset{\overset{2}{\cancel{6}}}{\cancel{78}}}{\underset{\cancel{5}}{\cancel{55}}} \times \frac{\cancel{11}}{\cancel{12}} = \frac{2}{9}.$

39. $\frac{17}{\cancel{5}} \times \frac{2}{13} \times \frac{1}{5} \times \frac{\overset{2}{\cancel{10}}}{1} = \frac{68}{65} = 1\tfrac{3}{65}.$

40. $\frac{\cancel{5}}{\cancel{18}} \times \frac{7}{\cancel{3}} \times \frac{\cancel{18}}{\cancel{5}} \times \frac{\overset{\cancel{3}}{\cancel{9}}}{\cancel{4}} \times \frac{\overset{2}{\cancel{8}}}{\underset{15}{\cancel{45}}} = \frac{14}{15}.$

Ex. 79. Page 121.

1. $3 \times 4\tfrac{5}{7} = 12\tfrac{15}{7} = 14\tfrac{1}{7}.$
2. $5 \times 7\tfrac{2}{9} = 35\tfrac{10}{9} = 36\tfrac{1}{9}.$
3. $21 \times 18\tfrac{3}{7} = 378\tfrac{9}{1} = 387.$
4. $22 \times 29\tfrac{3}{13} = 638\tfrac{66}{13} = 643\tfrac{1}{13}.$
5. $25 \times 12\tfrac{3}{4} = 300\tfrac{75}{4} = 318\tfrac{3}{4}.$
6. $6 \times 2\tfrac{2}{3} = 12\tfrac{4}{1} = 16.$
7. $7 \times 2\tfrac{3}{4} = 14\tfrac{21}{4} = 19\tfrac{1}{4}.$
8. $8 \times 2\tfrac{3}{5} = 16\tfrac{24}{5} = 20\tfrac{4}{5}.$
9. $6\tfrac{2}{5} \times 9 = 54\tfrac{18}{5} = 57\tfrac{3}{5}.$
10. $3\tfrac{3}{10} \times 10 = 30\tfrac{3}{1} = 33.$
11. $5\tfrac{5}{8} \times 9 = 45\tfrac{45}{8} = 50\tfrac{5}{8}.$
12. $2\tfrac{3}{10} \times 15 = 30\tfrac{9}{2} = 34\tfrac{1}{2}.$

13. $20 \times 2\frac{11}{12} = 40\frac{55}{3} = 58\frac{1}{3}$.
14. $12 \times 5\frac{3}{5} = 60\frac{36}{5} = 67\frac{1}{5}$.
15. $8 \times 7\frac{1}{3} = 56\frac{8}{3} = 58\frac{2}{3}$.
16. $9 \times 6\frac{3}{4} = 54\frac{27}{4} = 60\frac{3}{4}$.
17. $9 \times 3\frac{3}{5} = 27\frac{27}{5} = 32\frac{2}{5}$.
18. $12 \times 2\frac{7}{8} = 24\frac{21}{2} = 34\frac{1}{2}$.
19. $13 \times 3\frac{2}{3} = 39\frac{26}{3} = 47\frac{2}{3}$.
20. $16 \times 9\frac{1}{3} = 144\frac{16}{3} = 149\frac{1}{3}$.
21. $20 \times 5\frac{1}{5} = 100\frac{4}{1} = 104$.
22. $17 \times 4\frac{3}{4} = 68\frac{51}{4} = 80\frac{3}{4}$.
23. $18 \times 5\frac{2}{3} = 90\frac{12}{1} = 102$.
24. $15 \times 6\frac{7}{8} = 90\frac{105}{8} = 103\frac{1}{8}$.
25. $21 \times 9\frac{3}{4} = 189\frac{63}{4} = 204\frac{3}{4}$.
26. $41 \times 10\frac{1}{2} = 410\frac{41}{2} = 430\frac{1}{2}$.
27. $32 \times 11\frac{2}{3} = 352\frac{64}{3} = 373\frac{1}{3}$.
28. $36 \times 15\frac{4}{5} = 540\frac{144}{5} = 568\frac{4}{5}$.
29. $40 \times 16\frac{7}{8} = 640\frac{35}{1} = 675$.
30. $27 \times 13\frac{5}{6} = 351\frac{135}{6} = 373\frac{1}{2}$.

Ex. 80. (*Oral.*) Page 122.

1. $\frac{5}{9} \div 5 = \frac{1}{9}$.
2. $\frac{8}{11} \div 4 = \frac{2}{11}$.
3. $\frac{3}{7} \div 2 = \frac{3}{14}$.
4. $\frac{75}{19} \div 3 = 1\frac{6}{19}$.
5. $\frac{14}{20} \div 2 = \frac{7}{20}$.
6. $\frac{4}{9} \div 5 = \frac{4}{45}$.
7. $\frac{18}{27} \div 9 = \frac{2}{27}$.
8. $\frac{25}{30} \div 5 = \frac{1}{6}$.
9. $\frac{16}{17} \div 8 = \frac{2}{17}$.
10. $\frac{8}{10} \div 7 = \frac{4}{35}$.
11. $\frac{35}{90} \div 5 = \frac{7}{90}$.
12. $\frac{42}{50} \div 14 = \frac{3}{50}$.
13. $\frac{3}{11} \div 6 = \frac{1}{22}$.
14. $\frac{7}{12} \div 3 = \frac{7}{36}$.
15. $\frac{12}{17} \div 6 = \frac{2}{17}$.
16. $\frac{12}{17} \div 3 = \frac{4}{17}$.
17. $\frac{12}{17} \div 4 = \frac{3}{17}$.
18. $\frac{12}{17} \div 12 = \frac{1}{17}$.
19. $\frac{7}{8} \div 3 = \frac{7}{24}$.
20. $\frac{7}{8} \div 4 = \frac{7}{32}$.
21. $\frac{7}{8} \div 5 = \frac{7}{40}$.
22. $\frac{7}{8} \div 8 = \frac{7}{64}$.
23. $\frac{7}{8} \div 7 = \frac{1}{8}$.
24. $\frac{8}{13} \div 4 = \frac{2}{13}$.

Ex. 81. Page 123.

1. $\frac{\overset{7}{\cancel{42}}}{45} \times \frac{1}{\underset{2}{\cancel{12}}} = \frac{7}{90}$.

2. $\frac{\overset{14}{\cancel{350}}}{451} \times \frac{1}{\cancel{25}} = \frac{14}{451}$.

3. $\frac{\overset{22}{\cancel{88}}}{95} \times \frac{1}{\underset{3}{\cancel{12}}} = \frac{22}{285}$.

4. $\frac{\overset{6}{\cancel{78}}}{95} \times \frac{1}{\cancel{13}} = \frac{6}{95}$.

5. $\frac{\overset{8}{\cancel{152}}}{209} \times \frac{1}{\cancel{19}} = \frac{8}{209}$.

6. $\frac{7}{24} \times \frac{11}{5} = \frac{77}{120}$.

7. $\frac{\cancel{3}}{\cancel{2}} \times \frac{\overset{4}{\cancel{8}}}{\cancel{3}} = 4$.

8. $\frac{5}{2}\times\frac{4}{3}=\frac{20}{6}=3\frac{1}{3}$.

9. $\frac{\cancel{2}}{3}\times\frac{5}{\underset{2}{\cancel{4}}}=\frac{5}{6}$.

10. $\frac{7}{\underset{2}{\cancel{8}}}\times\frac{\cancel{4}}{9}=\frac{7}{18}$.

11. $\frac{13}{\cancel{2}}\times\frac{\overset{3}{\cancel{6}}}{25}=\frac{39}{25}=1\frac{14}{25}$.

12. $\frac{4}{\cancel{5}}\times\frac{\overset{2}{\cancel{10}}}{73}=\frac{8}{73}$.

13. $\frac{\overset{3}{\cancel{39}}}{\underset{2}{\cancel{10}}}\times\frac{\cancel{5}}{\cancel{13}}=\frac{3}{2}=1\frac{1}{2}$.

14. $\frac{3}{4}\times\frac{9}{2}=\frac{27}{8}=3\frac{3}{8}$.

15. $\frac{2}{7}\times\frac{8}{5}=\frac{16}{35}$.

16. $\frac{1}{\cancel{2}}\times\frac{3}{\cancel{4}}\times\frac{\overset{\cancel{4}}{\cancel{8}}}{7}=\frac{3}{7}$.

17. $\frac{\cancel{3}}{\cancel{4}}\times\frac{2}{\underset{3}{\cancel{9}}}\times\frac{\overset{7}{\cancel{28}}}{5}=\frac{14}{15}$.

18. $\frac{2}{5}\times\frac{7}{\cancel{2}}\times\frac{28}{27}=\frac{196}{135}=1\frac{61}{135}$.

19. $\frac{\overset{5}{\cancel{25}}}{\underset{3}{\cancel{39}}}\times\frac{\cancel{13}}{\underset{2}{\cancel{10}}}=\frac{5}{6}$.

20. $\frac{\overset{6}{\cancel{12}}}{\underset{7}{\cancel{49}}}\times\frac{\cancel{7}}{\cancel{2}}=\frac{6}{7}$.

21. $\frac{\cancel{43}}{5}\times\frac{7}{\cancel{43}}=\frac{7}{5}=1\frac{2}{5}$.

22. $\frac{\overset{32}{\cancel{64}}}{\underset{3}{\cancel{9}}}\times\frac{\cancel{3}}{\underset{13}{\cancel{26}}}=\frac{32}{39}$.

23. $\frac{\cancel{3}}{7}\times\frac{19}{\underset{5}{\cancel{15}}}=\frac{19}{35}$.

24. $\frac{\cancel{17}}{\underset{7}{\cancel{63}}}\times\frac{\overset{12}{\cancel{108}}}{\underset{5}{\cancel{85}}}=\frac{12}{35}$.

25. $\frac{\overset{35}{\cancel{175}}}{\underset{4}{\cancel{48}}}\times\frac{\cancel{12}}{\cancel{5}}=\frac{35}{4}=8\frac{3}{4}$.

26. $\frac{\cancel{19}}{\underset{3}{\cancel{6}}}\times\frac{\cancel{2}}{\cancel{19}}=\frac{1}{3}$.

27 $\frac{55}{\underset{3}{\cancel{6}}}\times\frac{\cancel{2}}{7}=\frac{55}{21}=2\frac{13}{21}$.

28. $\frac{\overset{4}{\cancel{8}}}{1}\times\frac{15}{\underset{7}{\cancel{14}}}=\frac{60}{7}=8\frac{4}{7}$.

29. $\frac{\cancel{19}}{1}\times\frac{20}{\cancel{19}}=20.$

30. $\frac{\overset{12}{\cancel{24}}}{\cancel{7}}\times\frac{\cancel{7}}{\underset{11}{\cancel{22}}}=\frac{12}{11}=1\frac{1}{11}.$

31. $\frac{1}{\cancel{2}}\times\frac{\cancel{3}}{\cancel{5}}\times\frac{\overset{\cancel{2}}{\cancel{10}}}{\underset{3}{\cancel{9}}}=\frac{1}{3}.$

32. $\frac{\overset{3}{\cancel{15}}}{\underset{2}{\cancel{8}}}\times\frac{\overset{9}{\cancel{36}}}{\cancel{5}}\times\frac{9}{22}=\frac{243}{44}=5\frac{23}{44}.$

33. $\frac{11}{5}\times\frac{\cancel{7}}{4}\times\frac{3}{\cancel{7}}=\frac{33}{20}=1\frac{13}{20}.$

34. $\frac{\overset{3}{\cancel{9}}}{\cancel{5}}\times\frac{\overset{5}{\cancel{25}}}{\cancel{3}}\times\frac{8}{7}=\frac{120}{7}=17\frac{1}{7}.$

35. $\frac{\cancel{3}}{\cancel{5}}\times\frac{\cancel{5}}{2}\times\frac{\cancel{19}}{\underset{4}{\cancel{12}}}\times\frac{3}{\cancel{19}}=\frac{3}{8}.$

36. $\frac{\cancel{2}}{\cancel{3}}\times\frac{\overset{3}{\cancel{9}}}{\cancel{2}}\times\frac{\cancel{9}}{7}\times\frac{5}{\underset{2}{\cancel{18}}}=\frac{15}{14}=1\frac{1}{14}.$

37. $\frac{\cancel{8}}{\cancel{3}}\times\frac{\cancel{5}}{\cancel{4}}\times\frac{\cancel{3}}{\underset{2}{\cancel{10}}}\times\frac{\cancel{4}}{\underset{3}{\cancel{15}}}=\frac{1}{6}$

38. $\frac{\cancel{11}}{\cancel{5}}\times\frac{\cancel{5}}{\cancel{2}}\times\frac{\overset{7}{\cancel{14}}}{\cancel{3}}\times\frac{\cancel{3}}{\cancel{11}}=7.$

39. $\frac{\cancel{3}}{\cancel{2}}\times\frac{\overset{4}{\cancel{8}}}{\underset{3}{\cancel{9}}}\times\frac{\overset{7}{\cancel{21}}}{5}\times\frac{23}{\cancel{3}}=\frac{644}{15}=42\frac{14}{15}$

40. $\frac{11}{\cancel{3}}\times\frac{\cancel{21}}{4}\times\frac{\overset{5}{\cancel{15}}}{2}\times\frac{1}{\underset{3}{\cancel{6}\cancel{3}}}=\frac{55}{24}=2\frac{7}{24}.$

41. $\frac{17}{\cancel{5}}\times\frac{\overset{\overset{5}{\cancel{10}}}{\cancel{50}}}{\cancel{7}}\times\frac{\cancel{7}}{\cancel{5}}\times\frac{\cancel{5}}{\underset{8}{\cancel{16}}}=\frac{85}{8}=10\frac{5}{8}.$

42. $\frac{\overset{\cancel{3}}{\cancel{36}}}{\cancel{5}}\times\frac{\overset{2}{\cancel{10}}}{\cancel{3}}\times\frac{10}{11}\times\frac{7}{\cancel{12}}=\frac{140}{11}$
$=12\frac{8}{11}.$

43. $\frac{\overset{3}{\cancel{9}}}{1}\times\frac{\cancel{11}}{2}\times\frac{17}{\underset{2}{\cancel{22}}}\times\frac{5}{\underset{8}{\cancel{24}}}=\frac{255}{32}=7\frac{31}{32}.$

44. $\frac{\overset{8}{\cancel{16}}}{1}\times\frac{\cancel{15}}{\cancel{7}}\times\frac{\cancel{11}}{\underset{\cancel{2}}{\cancel{30}}}\times\frac{\overset{5}{\cancel{35}}}{\cancel{11}}=40.$

45. $\frac{\overset{9}{\cancel{27}}}{\cancel{8}}\times\frac{\overset{3}{\cancel{24}}}{\cancel{5}}\times\frac{\cancel{5}}{\cancel{2}}\times\frac{\cancel{2}}{13}\times\frac{8}{\cancel{3}}=\frac{216}{13}$
$=16\frac{8}{13}.$

Ex. 82. Page 124.

1. Find the quotient of $19\frac{1}{2} \div 3$.

$3)19\frac{1}{2}(6$
$\underline{18}$
$1\frac{1}{2}$

$1\frac{1}{2} = \frac{3}{2}$ and $\frac{3}{2} \div 3 = \frac{1}{2}$.

$6\frac{1}{2}$. *Ans.*

2. Find the quotient of $12\frac{4}{5} \div 5$.

$5)12\frac{4}{5}(2$
$\underline{10}$
$2\frac{4}{5}$

$2\frac{4}{5} = \frac{14}{5}$ and $\frac{14}{5} \div 5 = \frac{14}{25}$.

$2\frac{14}{25}$. *Ans.*

3. Find the quotient of $24\frac{2}{3} \div 8$.

$8)24\frac{2}{3}(3$
$\underline{24}$
$\frac{2}{3}$

$\frac{2}{3} \div 8 = \frac{2}{24} = \frac{1}{12}$.

$3\frac{1}{12}$. *Ans.*

4. Find the quotient of $19\frac{3}{7} \div 6$.

$6)19\frac{3}{7}(3$
$\underline{18}$
$1\frac{3}{7}$

$1\frac{3}{7} = \frac{10}{7}$ and $\frac{10}{7} \div 6 = \frac{5}{21}$.

$3\frac{5}{21}$. *Ans.*

5. Find the quotient of $17\frac{5}{9} \div 9$.

$9)17\frac{5}{9}(1$
$\underline{9}$
$8\frac{5}{9}$

$8\frac{5}{9} = \frac{77}{9}$ and $\frac{77}{9} \div 9 = \frac{77}{81}$.

$1\frac{77}{81}$. *Ans.*

6. Find the quotient of $34\frac{3}{5} \div 17$.

$17)34\frac{3}{5}(2$
$\underline{34}$
$\frac{3}{5}$

$\frac{3}{5} \div 17 = \frac{3}{85}$.

$2\frac{3}{85}$. *Ans.*

7. Find the quotient of $31\frac{4}{9} \div 11$.

$11)31\frac{4}{9}(2$
$\underline{22}$
$9\frac{4}{9}$

$9\frac{4}{9} = \frac{85}{9}$ and $\frac{85}{9} \div 11 = \frac{85}{99}$.

$2\frac{85}{99}$. *Ans.*

8. Find the quotient of $37\frac{5}{8} \div 18$.

$18)37\frac{5}{8}(2$
$\underline{36}$
$1\frac{5}{8}$

$1\frac{5}{8} = \frac{13}{8}$ and $\frac{13}{8} \div 18 = \frac{13}{144}$.

$2\frac{13}{144}$. *Ans.*

9. Find the quotient of $45\frac{3}{17} \div 7$.

$7)45\frac{3}{17}(6$
$\underline{42}$
$3\frac{3}{17}$

$3\frac{3}{17} = \frac{54}{17}$ and $\frac{54}{17} \div 7 = \frac{54}{119}$.

$6\frac{54}{119}$. *Ans.*

10. Find the quotient of $57\frac{5}{9} \div 16$.

$16)57\frac{5}{9}(3$
$\underline{48}$
$9\frac{5}{9}$

$9\frac{5}{9} = \frac{86}{9}$ and $\frac{86}{9} \div 16 = \frac{43}{72}$.

$3\frac{43}{72}$. *Ans.*

11. Find the quotient of $65\frac{4}{13} \div 9$.

$9)65\frac{4}{13}(7$
63
$2\frac{4}{13}$

$2\frac{4}{13} = \frac{30}{13}$ and $\frac{30}{13} \div 9 = \frac{10}{39}$.

$7\frac{10}{39}$. *Ans.*

12. Find the quotient of $147\frac{5}{9} \div 13$.

$13)147\frac{5}{9}(11$
13
17
13
$4\frac{5}{9}$

$4\frac{5}{9} = \frac{41}{9}$ and $\frac{41}{9} \div 13 = \frac{41}{117}$.

$11\frac{41}{117}$. *Ans.*

13. Find the quotient of $76\frac{5}{7} \div 19$.

$19)76\frac{5}{7}(4$
76
$\frac{5}{7}$

$\frac{5}{7} \div 19 = \frac{5}{133}$.

$4\frac{5}{133}$. *Ans.*

14. Find the quotient of

$124\frac{7}{29} \div 6$.

$6)124\frac{7}{29}(20$
12
$4\frac{7}{29}$

$4\frac{7}{29} = \frac{123}{29}$ and $\frac{123}{29} \div 6 = \frac{41}{58}$.

$20\frac{41}{58}$. *Ans.*

15. Find the quotient of

$326\frac{5}{17} \div 15$.

$15)326\frac{5}{17}(21$
30
26
15
$11\frac{5}{17}$

$11\frac{5}{17} = \frac{192}{17}$ and $\frac{192}{17} \div 15 = \frac{64}{85}$.

$21\frac{64}{85}$. *Ans.*

Ex. 83. Page 124.

1. What must be paid for 24 yards of cloth, at $\$\frac{5}{7}$ per yard?

$$24 \times \frac{\$5}{7} = \frac{\$120}{7} = \$17\tfrac{1}{7}. \text{ Ans.}$$

2. A farmer bought 327 sheep, at $\$4\frac{2}{3}$ a head; required the cost of the flock.

327
$4\frac{2}{3}$
1308
218
1526

$\$1526$. *Ans.*

3. At 25 cents a pound, what must be paid for $82\frac{1}{2}$ pounds of butter?

$\$0.25$
$82\frac{1}{2}$
50
200
$12\frac{1}{2}$
$\$20.62\frac{1}{2}$ *Ans.*

4. A merchant sold $15\frac{2}{7}$ yards of silk, at $\$4\frac{2}{3}$ per yard; what change should he give back from 8 ten-dollar bills?

$$15\tfrac{2}{7} \times 4\tfrac{2}{3} = \frac{107}{\cancel{7}} \times \frac{\overset{2}{\cancel{14}}}{3} = \frac{214}{3} = 71\tfrac{1}{3}.$$

$\$80 - \$71\frac{1}{3} = \$8\frac{2}{3}$. *Ans.*

5. If beeksteak cost 22 cents per pound, and mutton chops 21 cents, how much will a man pay for meat, who eats $\frac{1}{2}$ pound of beefsteak for breakfast, and $1\frac{2}{3}$ pounds of mutton chops for dinner?

$$\begin{array}{r} 22 \times \frac{1}{2} = 11 \\ 21 \times \frac{5}{3} = \underline{35} \\ 46 \end{array}$$

46 cents. *Ans.*

6. At $\$\frac{4}{5}$ per yard, how much cloth can be bought for $25?

$$25 \div \frac{4}{5} = 25 \times \frac{5}{4} = \frac{125}{4} = 31\frac{1}{4}.$$

$31\frac{1}{4}$ yds. *Ans.*

7. If $\$19\frac{1}{2}$ be paid for 9 yards of silk, what is the cost per yard?

$$\begin{array}{l} 9)\,19\frac{1}{2}\,(2 \\ \quad\underline{18} \\ \quad\;\; 1\frac{1}{2} \end{array}$$

$$1\frac{1}{2} = \frac{3}{2} \text{ and } \frac{3}{2} \div 9 = \frac{1}{6}.$$

$\$2\frac{1}{6}$. *Ans.*

8. A man walks $37\frac{4}{5}$ miles in 6 hours; how many miles does he walk an hour?

$$\begin{array}{l} 6)\,37\frac{4}{5}\,(6 \\ \quad\underline{36} \\ \quad\;\; 1\frac{4}{5} \end{array}$$

$$1\frac{4}{5} = \frac{9}{5} \text{ and } \frac{9}{5} \div 6 = \frac{3}{10}.$$

$6\frac{3}{10}$. *Ans.*

9. A farmer sells $19\frac{1}{2}$ acres of land for $375; what is the price per acre?

$$375 \div 19\frac{1}{2} = 375 \div \frac{39}{2} = 375 \times \frac{2}{39} = \frac{750}{39} = 19\frac{3}{13}. \qquad \$19\tfrac{3}{13}.\ \textit{Ans.}$$

10. A lady pays $3 for $\frac{8}{9}$ of a yard of silk; what is the price per yard?

$$3 \div \frac{8}{9} = 3 \times \frac{9}{8} = \frac{27}{8} = 3\frac{3}{8}. \qquad \$3\tfrac{3}{8}.\ \textit{Ans.}$$

11. A man in one year pays $45.26 for cigars, the average price of which is $6\frac{1}{5}$ cents apiece. How many does he smoke in a year?

$$4526 \div 6\frac{1}{5} = \overset{146}{\cancel{4526}} \times \frac{5}{\cancel{31}} = 730.\ \textit{Ans.}$$

12. If $\frac{7}{9}$ of an acre of tillage land cost $125, what is the price per acre? How many acres can be bought for $1297?

$$\$125 \div \frac{7}{9} = \$125 \times \frac{9}{7} = \$\frac{1125}{7} = \$160\frac{5}{7}.\ \textit{Ans.}$$

$$\$1297 \div \$160\frac{5}{7} = 1297 \times \frac{7}{1125} = \frac{9079}{1125} = 8\frac{79}{1125}.\ \textit{Ans.}$$

13. Gideon Lyford earns $30 per week; what will remain at the close of the week when he has paid for $6\frac{2}{3}$ pound of butter, at 33 cents a pound, $10\frac{1}{2}$ pounds of mutton, at 20 cents a pound, $8\frac{2}{5}$ pounds of beef, at 25 cents, 3 boxes of strawberries, at 16 cents, 150 pounds of ice, at $\frac{1}{2}$ cent, 20 loaves of bread, at 10 cents, fuel \$2, vegetables \$3?

$$\begin{array}{lr} & 6\frac{2}{3} \times \$0.33 = \$2.20 \\ & 10\frac{1}{2} \times \$0.20 = 2.10 \\ & 8\frac{2}{5} \times \$0.25 = 2.10 \\ & 3 \times \$0.16 = 0.48 \\ & 150 \times \$0.005 = 0.75 \\ & 20 \times \$0.10 = 2.00 \\ \$30.00 & 2.00 \\ \underline{14.63} & \underline{3.00} \\ \$15.37 \textit{ Ans.} & \$14.63 \end{array}$$

14. Find the product of $17\frac{3}{5} \times 8\frac{1}{3}$ of $6\frac{3}{10}$.

$$17\frac{3}{5} \times 8\frac{1}{3} \times 6\frac{3}{10} = \frac{\overset{44}{\cancel{88}}}{\cancel{5}} \times \frac{\overset{\cancel{5}}{\cancel{25}}}{\cancel{3}} \times \frac{\overset{21}{\cancel{63}}}{\underset{\cancel{2}}{\cancel{10}}} = 924. \textit{ Ans.}$$

15. If a man build $\frac{9}{10}$ of a rod of wall in one hour, how much will he build in $\frac{4}{5}$ of an hour?

$$\frac{\overset{2}{\cancel{4}}}{5} \times \frac{9}{\underset{5}{\cancel{10}}} = \frac{18}{25} \text{ rd. } \textit{Ans.}$$

16. If a ship costs \$16,785, what will $\frac{4}{5}$ of it be worth?

$$\frac{4}{\cancel{5}} \times \frac{\overset{3357}{\$\cancel{16785}}}{1} = \$13,428. \textit{ Ans.}$$

17. If a water-pipe discharges $16\frac{1}{3}$ barrels of water in an hour, how many barrels will it discharge in $9\frac{2}{7}$ hours?

$$9\frac{2}{7} \times 16\frac{1}{3} = \frac{65}{\cancel{7}} \times \frac{\overset{7}{\cancel{49}}}{3} = \frac{455}{3} = 151\frac{2}{3}. \textit{ Ans.}$$

18. For 4 sheep $\$25\frac{2}{3}$ are paid; what is the price per head?

$$\begin{array}{r} 4)\underline{\$25\frac{2}{3}} \\ \$6\frac{5}{12}. \textit{ Ans.} \end{array}$$

19. A coal dealer paid \$375 freight for transporting coal from Scranton to Hudson. If the price was \$¾ per ton, how many tons were transported?

$$375 \div \frac{3}{4} = \frac{\overset{125}{\cancel{375}}}{1} \times \frac{4}{\cancel{3}} = 500 \quad \textit{Ans.}$$

20. How many pounds of beef, at 18¾ cents per pound, can be bought for \$17.48?

$$1748 \div 18\tfrac{3}{4} = 1748 \times \tfrac{4}{75} = 93\tfrac{17}{75}. \quad \textit{Ans.}$$

21. A farmer hires an equal number of men and boys, and pays for a man and boy \$2⅝ a day. If the pay roll is \$84 a day, how many men and boys does he hire?

$$84 \div 2\tfrac{5}{8} = \frac{\overset{4}{\cancel{84}}}{1} \times \frac{8}{\cancel{21}} = 32. \qquad 32 \textit{ Ans.}$$

22. When $8\frac{79}{1125}$ acres of land cost \$1297, what will $\frac{7}{9}$ of an acre cost?

$$\$1297 \div 8\tfrac{79}{1125} = \frac{\cancel{1297}}{1} \times \frac{1125}{\underset{7}{\cancel{9079}}} = \frac{1125}{7}$$

$$\frac{\cancel{7}}{\cancel{9}} \times \frac{\overset{125}{\cancel{1125}}}{\cancel{7}} = 125. \qquad \$125. \textit{ Ans.}$$

23. A city speculator in land divided ¾ of an acre into lots of $\frac{1}{16}$ of an acre each, and sold them all for \$13,426⅔. What was the average price per lot?

$$\frac{3}{4} \div \frac{1}{16} = \frac{3}{\cancel{4}} \times \frac{\overset{4}{\cancel{16}}}{1} = 12.$$

$$12\overline{)13426\tfrac{2}{3}} \qquad \$1118\tfrac{8}{9}. \textit{ Ans.}$$
$$1118\tfrac{8}{9}$$

24. For ⅔ of ¾ of a ship the sum of \$6394 was received; what is the value of the ship?

$$\frac{\cancel{2}}{\cancel{3}} \times \frac{\cancel{3}}{\cancel{4}} = \frac{1}{2}. \qquad 2 \times \$6394 = \$12,788. \textit{ Ans.}$$

25. A vessel sails $17\frac{2}{5}$ miles per hour; how many miles will she sail in $26\frac{2}{3}$ hours?

$$26\tfrac{2}{3} \times 17\tfrac{2}{5} = \frac{\overset{16}{\cancel{80}}}{\cancel{3}} \times \frac{\overset{29}{\cancel{87}}}{\cancel{5}} = 464.\ \textit{Ans.}$$

26. George is $13\frac{1}{2}$ years old, Henry is $\frac{3}{4}$ as old as George, and John's age is $1\frac{4}{9}$ that of Henry; what is the age of John?

$$13\tfrac{1}{2} \times \tfrac{3}{4} \times 1\tfrac{4}{9} = \frac{\overset{3}{\cancel{27}}}{2} \times \frac{3}{4} \times \frac{13}{\cancel{9}} = \frac{117}{8} = 14\tfrac{5}{8}.\ \textit{Ans.}$$

27. There are $16\frac{1}{2}$ feet in one rod; how many feet are there in $84\frac{5}{9}$ rods?

$$84\tfrac{5}{9} \times 16\tfrac{1}{2} = \frac{761}{\underset{3}{\cancel{9}}} \times \frac{\overset{11}{\cancel{33}}}{2} = \frac{8371}{6} = 1395\tfrac{1}{6}.\ \textit{Ans.}$$

28. How many feet around a field, each one of whose four sides measures $7\frac{5}{9}$ rods?

$$7\tfrac{5}{9} \times 4 \times 16\tfrac{1}{2} = \frac{68}{\underset{3}{\cancel{9}}} \times \frac{\overset{2}{\cancel{4}}}{1} \times \frac{\overset{11}{\cancel{33}}}{\cancel{2}} = \frac{1496}{3} = 498\tfrac{2}{3}.\ \textit{Ans.}$$

29. A schooner sails on the average $175\frac{5}{8}$ miles a day; how far will she sail in a week?

$$\begin{array}{r} 175\frac{5}{8} \\ 7 \\ \hline 1229\frac{3}{8} \end{array}\ \textit{Ans.}$$

30. At the rate of $8\frac{2}{3}$ miles per hour, how many miles will a ship sail from a quarter past three A.M. to a quarter before six P.M.?

$$14\tfrac{1}{2} \times 8\tfrac{2}{3} = \frac{29}{\cancel{2}} \times \frac{\overset{13}{\cancel{26}}}{3} = \frac{377}{3} = 125\tfrac{2}{3}.\ \textit{Ans.}$$

31. Reduce $\frac{3}{7}$ of $\frac{5}{11}$ of $\frac{7}{25}$ of $\frac{35}{49}$ to a simple fraction in its lowest terms.

$$\frac{3}{7} \times \frac{\cancel{5}}{11} \times \frac{\cancel{7}}{\underset{\cancel{5}}{\cancel{25}}} \times \frac{\overset{\cancel{5}}{\cancel{35}}}{\underset{\cancel{7}}{\cancel{49}}} = \frac{3}{77}.\ \textit{Ans.}$$

32. George Ward inherited from his father $\frac{11}{13}$ of a farm containing 377 acres. He divided his share equally among his four sons; how many acres did each one of the sons receive?

$$\frac{11}{\cancel{13}} \times \frac{\overset{29}{\cancel{377}}}{1} = 319. \qquad 319 \div 4 = 79\tfrac{3}{4}.\ \textit{Ans.}$$

33. How many pounds of sugar, at $9\frac{1}{2}$ cents a pound, can be bought for $1.52?

$$152 \div 9\tfrac{1}{2} = \frac{\overset{8}{\cancel{152}}}{1} \times \frac{2}{\cancel{19}} = 16.\ \textit{Ans.}$$

34. For $23\frac{2}{3}$ baskets of peaches, a grocer gave $20.59; what was the price per basket?

$$20.59 \div 23\tfrac{2}{3} = 20.59 \times \tfrac{3}{71} = \frac{61.77}{71} = 0.87.$$

$0.87. *Ans.*

35. A farmer sold 42 bushels of potatoes for $26.58; what was the average price per bushel?

$$\begin{array}{r}
0.63 \\
42)\overline{\$26.58} \\
\underline{252} \\
138 \\
\underline{126} \\
12
\end{array}$$

0.63\frac{2}{7}$. *Ans.* $\qquad \frac{12}{42} = \frac{2}{7}$

36. At $37\frac{1}{2}$ cents per yard, how many yards of lace can be bought for $$5\frac{1}{4}$?

$5\frac{1}{4}$ = 525 cents.

$$525 \div 37\tfrac{1}{2} = \frac{\overset{7}{\cancel{525}}}{1} \times \frac{2}{\cancel{75}} = 14.\ \textit{Ans.}$$

37. A farmer sold $6\frac{1}{2}$ bushels of apples for 4.87\frac{1}{2}$; what was the price per bushel?

$$487\tfrac{1}{2} \div 6\tfrac{1}{2} = \frac{\overset{75}{\cancel{975}}}{\cancel{2}} \times \frac{\cancel{2}}{\cancel{13}} = 75 \text{ cents. } \textit{Ans.}$$

38. When $6\frac{1}{2}$ bushels of apples bring $3.90, what are they worth a peck? (Four pecks make a bushel.)

$3.90 ÷ 26 = $0.15. *Ans.*

39. At 60 cents a pound, how many pounds of tea can be bought for \$4.65?

$$6\cancel{0}\,\underline{)\,46\cancel{5}}\qquad 7\tfrac{45}{60} = 7\tfrac{3}{4}.\ \textit{Ans.}$$

40. If $\frac{3}{10}$ of a yard of cloth cost 80 cents, what should be paid for $\frac{5}{12}$ of a yard?

$$\frac{\overset{20}{\cancel{80}}}{1} \times \frac{10}{3} \times \frac{5}{\underset{3}{\cancel{12}}} = \frac{1000}{9} = 111\tfrac{1}{9}. \qquad \$1.11\tfrac{1}{9}.\ \textit{Ans.}$$

41. The cost of fencing a lot $8\frac{1}{2}$ rods in circuit is \$ $6\frac{4}{5}$, what is the rate per rod?

$$6\tfrac{4}{5} \div 8\tfrac{1}{2} = \frac{\overset{2}{\cancel{34}}}{5} \times \frac{2}{\cancel{17}} = \frac{4}{5} = 80. \qquad 80 \text{ cents. } \textit{Ans.}$$

42. A roll of carpeting containing 202 yards is cut into pieces of $25\frac{1}{4}$ yards each, and each piece is sold for \$ $32\frac{1}{2}$. Required the number of pieces, and the price per yard.

$$202 \div 25\tfrac{1}{4} = \frac{\overset{2}{\cancel{202}}}{1} \times \frac{4}{\cancel{101}} = 8.\ \textit{Ans.}$$

$$\$32\tfrac{1}{2} = \$32.50 \text{ and } 25\tfrac{1}{4} = 25.25.$$

$$\begin{array}{r@{}l} & \underline{\ \ 1.29} \\ 2525) & 3250 \\ & \underline{2525} \\ & \ \ 7250 \\ & \ \ \underline{5050} \\ & \ \ 22000 \\ & \ \ \underline{22725} \end{array} \qquad \$1.29.\ \textit{Ans.}$$

43. When $35\frac{3}{4}$ bushels of turnips cost \$28.60, what should be paid for $\frac{1}{2}$ of a bushel?

$$2860 \div 35\tfrac{3}{4} \times \tfrac{1}{2} = \frac{\overset{20}{\cancel{2860}}}{1} \times \frac{\overset{2}{\cancel{4}}}{\cancel{143}} \times \frac{1}{\cancel{2}} = 40 \text{ cents. } \textit{Ans.}$$

44. How many yards of cloth can be bought for \$10.80, if $\frac{7}{10}$ of a yard cost 63 cents?

$$63 \div \tfrac{7}{10} = \frac{\overset{9}{\cancel{63}}}{1} \times \frac{10}{\cancel{7}} = 90 \text{ cents.} \qquad 9\cancel{0}\,\underline{)\,108\cancel{0}}\ \ 12\ \textit{Ans.}$$

Ex. 84. (*Oral.*) Page 128.

Reduce:

1. $\frac{4}{5}$ to 20ths = $\frac{16}{20}$.
2. $\frac{1}{2}$ to 10ths = $\frac{5}{10}$.
3. $\frac{2}{3}$ to 9ths = $\frac{6}{9}$.
4. $\frac{3}{7}$ to 14ths = $\frac{6}{14}$.
5. $\frac{2}{9}$ to 18ths = $\frac{4}{18}$.
6. $\frac{3}{4}$ to 12ths = $\frac{9}{12}$.
7. $\frac{5}{6}$ to 24ths = $\frac{20}{24}$.
8. $\frac{5}{9}$ to 27ths = $\frac{15}{27}$.
9. $\frac{5}{11}$ to 33ds = $\frac{15}{33}$.
10. $\frac{4}{7}$ to 28ths = $\frac{16}{28}$.
11. $\frac{7}{12}$ to 36ths = $\frac{21}{36}$.
12. $\frac{7}{10}$ to 20ths = $\frac{14}{20}$.
13. $\frac{4}{15}$ to 45ths = $\frac{12}{45}$.
14. $\frac{1}{20}$ to 100ths = $\frac{5}{100}$.
15. $\frac{3}{13}$ to 26ths = $\frac{6}{26}$.
16. $\frac{5}{18}$ to 36ths = $\frac{10}{36}$.
17. $\frac{5}{9}$ to 81sts = $\frac{45}{81}$.
18. $\frac{7}{12}$ to 96ths = $\frac{56}{96}$.
19. $\frac{8}{11}$ to 44ths = $\frac{32}{44}$.
20. $\frac{3}{4}$ to 16ths = $\frac{12}{16}$.
21. $\frac{5}{24}$ to 72ds = $\frac{15}{72}$.

Ex. 85. (*Oral.*) Page 129.

Reduce to similar fractions:

1. $\frac{1}{2}, \frac{1}{3} = \frac{3}{6}, \frac{2}{6}$.
2. $\frac{1}{7}, \frac{1}{3} = \frac{3}{21}, \frac{7}{21}$.
3. $\frac{1}{2}, \frac{1}{4} = \frac{2}{4}, \frac{1}{4}$.
4. $\frac{1}{5}, \frac{1}{3} = \frac{3}{15}, \frac{5}{15}$.
5. $\frac{1}{4}, \frac{1}{5} = \frac{5}{20}, \frac{4}{20}$.
6. $\frac{3}{4}, \frac{5}{7} = \frac{21}{28}, \frac{20}{28}$.
7. $\frac{5}{8}, \frac{5}{6} = \frac{15}{24}, \frac{20}{24}$.
8. $\frac{2}{3}, \frac{3}{8} = \frac{16}{24}, \frac{9}{24}$.
9. $\frac{1}{3}, \frac{1}{7}, \frac{1}{21} = \frac{7}{21}, \frac{3}{21}, \frac{1}{21}$.
10. $\frac{1}{2}, \frac{1}{7}, \frac{1}{14} = \frac{7}{14}, \frac{2}{14}, \frac{1}{14}$.
11. $\frac{1}{2}, \frac{1}{4}, \frac{3}{8} = \frac{4}{8}, \frac{2}{8}, \frac{3}{8}$.
12. $\frac{1}{3}, \frac{1}{6}, \frac{1}{9} = \frac{6}{18}, \frac{3}{18}, \frac{2}{18}$.
13. $\frac{2}{3}, \frac{3}{4}, \frac{1}{6} = \frac{8}{12}, \frac{9}{12}, \frac{2}{12}$.
14. $\frac{3}{4}, \frac{5}{6}, \frac{1}{12} = \frac{9}{12}, \frac{10}{12}, \frac{1}{12}$.
15. $\frac{2}{3}, \frac{4}{9}, \frac{5}{18} = \frac{12}{18}, \frac{8}{18}, \frac{5}{18}$.
16. $\frac{1}{2}, \frac{2}{9}, \frac{5}{6} = \frac{9}{18}, \frac{4}{18}, \frac{15}{18}$.

Ex. 86. Page 129.

Reduce to similar fractions:

1. $\frac{15}{17}, \frac{26}{51}, \frac{65}{102}$.

$\cancel{17} \quad \cancel{51} \quad 102$

L. C. D. = 102.

$$\frac{15 \times 6}{17 \times 6} = \frac{90}{102}.$$

$$\frac{26 \times 2}{51 \times 2} = \frac{52}{102}.$$

$$\frac{65}{102} = \frac{65}{102}.$$

2. $\frac{7}{12}, \frac{5}{36}, \frac{11}{48}$.

$$\begin{array}{r|rrr} 12 & \cancel{12} & 36 & 48 \\ \hline & & 3 & 4 \end{array}$$

$12 \times 3 \times 4 = 144 =$ L. C. D.

$$\frac{7 \times 12}{12 \times 12} = \frac{84}{144}.$$

$$\frac{5 \times 4}{36 \times 4} = \frac{20}{144}.$$

$$\frac{11 \times 3}{48 \times 3} = \frac{33}{144}.$$

3. $\frac{3}{21}, \frac{2}{28}, \frac{5}{7}$.

$$\begin{array}{r|lll} 7 & 21 & 28 & \cancel{7} \\ \hline & 3 & 4 & \end{array}$$

$7 \times 3 \times 4 = 84 = $ L. C. D.

$$\frac{3 \times 4}{21 \times 4} = \frac{12}{84}.$$

$$\frac{2 \times 3}{28 \times 3} = \frac{6}{84}.$$

$$\frac{5 \times 12}{7 \times 12} = \frac{60}{84}.$$

4. $\frac{4}{19}, \frac{3}{38}, \frac{2}{3}$.

$$\cancel{19} \quad 38 \quad 3$$

$3 \times 38 = 114 = $ L. C. D.

$$\frac{4 \times 6}{19 \times 6} = \frac{24}{114}.$$

$$\frac{3 \times 3}{38 \times 3} = \frac{9}{114}.$$

$$\frac{2 \times 38}{3 \times 38} = \frac{76}{114}.$$

5. $\frac{4}{9}, \frac{5}{14}, \frac{5}{42}$.

$$\begin{array}{r|lll} 3 & 9 & \cancel{14} & 42 \\ \hline & 3 & & 14 \end{array}$$

$3 \times 3 \times 14 = 126 = $ L. C. D.

$$\frac{4 \times 14}{9 \times 14} = \frac{56}{126}.$$

$$\frac{5 \times 9}{14 \times 9} = \frac{45}{126}.$$

$$\frac{5 \times 3}{42 \times 3} = \frac{15}{126}.$$

6. $\frac{2}{3}, \frac{5}{13}, \frac{12}{39}, \frac{25}{78}$.

$$\cancel{3} \quad \cancel{13} \quad \cancel{39} \quad 78$$

$78 = $ L. C. D.

$$\frac{2 \times 26}{3 \times 26} = \frac{52}{78}.$$

$$\frac{5 \times 6}{13 \times 6} = \frac{30}{78}.$$

$$\frac{12 \times 2}{39 \times 2} = \frac{24}{78}.$$

$$\frac{25}{78} = \frac{25}{78}.$$

7. $\frac{2}{3}, \frac{4}{5}, \frac{8}{15}, \frac{7}{25}$.

$$\begin{array}{r|llll} 5 & \cancel{3} & \cancel{5} & 15 & 25 \\ \hline & & & 3 & 5 \end{array}$$

$5 \times 3 \times 5 = 75 = $ L. C. D.

$$\frac{2 \times 25}{3 \times 25} = \frac{50}{75}.$$

$$\frac{4 \times 15}{5 \times 15} = \frac{60}{75}.$$

$$\frac{8 \times 5}{15 \times 5} = \frac{40}{75}.$$

$$\frac{7 \times 3}{25 \times 3} = \frac{21}{75}.$$

8. $\frac{1}{5}, \frac{7}{8}, \frac{13}{16}, \frac{19}{20}, \frac{3}{40}$.

$$\begin{array}{r|lllll} 8 & \cancel{5} & \cancel{8} & 16 & \cancel{20} & 40 \\ \hline & & & 2 & & 5 \end{array}$$

$8 \times 2 \times 5 = 80 = $ L. C. D.

$$\frac{1 \times 16}{5 \times 16} = \frac{16}{80}.$$

$$\frac{7 \times 10}{8 \times 10} = \frac{70}{80}.$$

$$\frac{13 \times 5}{16 \times 5} = \frac{65}{80}.$$

$$\frac{19 \times 4}{20 \times 4} = \frac{76}{80}.$$

$$\frac{3 \times 2}{40 \times 2} = \frac{6}{80}.$$

9. $\frac{7}{9}, \frac{5}{12}, \frac{17}{18}, \frac{23}{24}, \frac{7}{36}$.

$$\begin{array}{r|lllll} 12 & \cancel{9} & \cancel{12} & \cancel{18} & 24 & 36 \\ \hline & & & & 2 & 3 \end{array}$$

$$12 \times 2 \times 3 = 72 = \text{L.C.D.}$$

$$\frac{7 \times 8}{9 \times 8} = \frac{56}{72}.$$

$$\frac{5 \times 6}{12 \times 6} = \frac{30}{72}.$$

$$\frac{17 \times 4}{18 \times 4} = \frac{68}{72}.$$

$$\frac{23 \times 3}{24 \times 3} = \frac{69}{72}.$$

$$\frac{7 \times 2}{36 \times 2} = \frac{14}{72}.$$

10. $\frac{2}{3}, \frac{3}{4}, \frac{5}{7}, \frac{8}{21}, \frac{15}{42}$.

$$\begin{array}{r|lllll} 2 & \cancel{3} & 4 & \cancel{7} & \cancel{21} & 42 \\ \hline & & 2 & & & 21 \end{array}$$

$$2 \times 2 \times 21 = 84 = \text{L.C.D.}$$

$$\frac{2 \times 28}{3 \times 28} = \frac{56}{84}.$$

$$\frac{3 \times 21}{4 \times 21} = \frac{63}{84}.$$

$$\frac{5 \times 12}{7 \times 12} = \frac{60}{84}.$$

$$\frac{8 \times 4}{21 \times 4} = \frac{32}{84}.$$

$$\frac{15 \times 2}{42 \times 2} = \frac{30}{84}.$$

Ex. 87. (*Oral.*) Page 130.

Find the sum of:

1. $\frac{5}{12}, \frac{3}{12} = \frac{8}{12} = \frac{2}{3}$.
2. $\frac{9}{16}, \frac{7}{16} = \frac{16}{16} = 1$.
3. $\frac{8}{9}, \frac{4}{9} = \frac{12}{9} = 1\frac{1}{3}$.
4. $\frac{8}{15}, \frac{2}{15} = \frac{10}{15} = \frac{2}{3}$.
5. $\frac{11}{20}, \frac{9}{20} = \frac{20}{20} = 1$.
6. $\frac{21}{30}, \frac{19}{30} = \frac{40}{30} = 1\frac{1}{3}$.
7. $7\frac{1}{4}, 3\frac{1}{4} = 10\frac{2}{4} = 10\frac{1}{2}$.
8. $8\frac{3}{5}, 4\frac{2}{5} = 12\frac{5}{5} = 13$.
9. $5\frac{3}{8}, 4\frac{7}{8} = 9\frac{10}{8} = 10\frac{1}{4}$.
10. $9\frac{3}{10}, 5\frac{3}{10} = 14\frac{6}{10} = 14\frac{3}{5}$.
11. $8\frac{3}{4}, 5\frac{3}{4} = 13\frac{6}{4} = 14\frac{1}{2}$.
12. $7\frac{7}{12}, 3\frac{7}{12} = 10\frac{14}{12} = 11\frac{1}{6}$.
13. $\frac{5}{6}, \frac{2}{3} = \frac{9}{6} = 1\frac{1}{2}$.
14. $\frac{3}{4}, \frac{5}{8} = \frac{11}{8} = 1\frac{3}{8}$.
15. $\frac{9}{10}, \frac{3}{5} = \frac{15}{10} = 1\frac{1}{2}$.
16. $\frac{3}{8}, \frac{7}{24} = \frac{16}{24} = \frac{2}{3}$.
17. $\frac{2}{3}, \frac{7}{12} = \frac{15}{12} = 1\frac{1}{4}$.
18. $\frac{5}{6}, \frac{11}{18} = \frac{26}{18} = 1\frac{4}{9}$.
19. $3\frac{7}{10}, 4\frac{3}{20} = 7\frac{17}{20}$.
20. $2\frac{5}{6}, 3\frac{2}{3} = 5\frac{9}{6} = 6\frac{1}{2}$.
21. $8\frac{5}{12}, 7\frac{3}{4} = 15\frac{14}{12} = 16\frac{1}{6}$.
22. $6\frac{3}{8}, 5\frac{1}{2} = 11\frac{7}{8}$.
23. $7\frac{2}{3}, 4\frac{5}{9} = 11\frac{11}{9} = 12\frac{2}{9}$.
24. $9\frac{3}{10}, 8\frac{2}{5} = 17\frac{7}{10}$.

Ex. 88. Page 131.

1. Find the sum of $\frac{3}{4}, \frac{1}{2}, \frac{5}{8}$.

$$\frac{3}{4} + \frac{1}{2} + \frac{5}{8} = \frac{6}{8} + \frac{4}{8} + \frac{5}{8} = \frac{15}{8} = 1\frac{7}{8}.\ \textit{Ans.}$$

2. Find the sum of $\frac{5}{6}, \frac{7}{12}, \frac{2}{3}$.

$$\frac{5}{6} + \frac{7}{12} + \frac{2}{3} = \frac{10}{12} + \frac{7}{12} + \frac{8}{12} = \frac{25}{12} = 2\frac{1}{12}.\ \textit{Ans.}$$

3. Find the sum of $\frac{2}{3}$, $\frac{3}{4}$, $\frac{2}{5}$.

$$\tfrac{2}{3} + \tfrac{3}{4} + \tfrac{2}{5} = \tfrac{40}{60} + \tfrac{45}{60} + \tfrac{24}{60} = \tfrac{109}{60} = 1\tfrac{49}{60}. \text{ \textit{Ans.}}$$

4. Find the sum of $\frac{7}{8}$, $\frac{3}{5}$, $\frac{2}{3}$.

$$\tfrac{7}{8} + \tfrac{3}{5} + \tfrac{2}{3} = \tfrac{105}{120} + \tfrac{72}{120} + \tfrac{80}{120} = \tfrac{257}{120} = 2\tfrac{17}{120}. \text{ \textit{Ans.}}$$

5. Find the sum of $\frac{7}{8}$, $\frac{5}{6}$, $\frac{4}{9}$.

$$\tfrac{7}{8} + \tfrac{5}{6} + \tfrac{4}{9} = \tfrac{63}{72} + \tfrac{60}{72} + \tfrac{32}{72} = \tfrac{155}{72} = 2\tfrac{11}{72}. \text{ \textit{Ans.}}$$

6. Find the sum of $\frac{5}{6}$, $\frac{4}{9}$, $\frac{11}{15}$.

$$\tfrac{5}{6} + \tfrac{4}{9} + \tfrac{11}{15} = \tfrac{75}{90} + \tfrac{40}{90} + \tfrac{66}{90} = \tfrac{181}{90} = 2\tfrac{1}{90}. \text{ \textit{Ans.}}$$

7. Find the sum of $4\frac{5}{6}$, $3\frac{2}{3}$, $6\frac{5}{12}$.

$$\begin{array}{ll}
\text{L. C. D.} = 12. & \\
\text{Numerators} \ldots\ldots & \left\{\begin{array}{r}10\\8\\\underline{5}\end{array}\right. \\
\text{Sum of numerators} & = 23 \\
\text{Sum of fractions} & = \tfrac{23}{12} = \qquad 1\tfrac{11}{12} \\
\text{Sum of integers} & = 4 + 3 + 6 = \underline{13} \\
 & \qquad\qquad\quad 14\tfrac{11}{12} \text{ \textit{Ans.}}
\end{array}$$

8. Find the sum of $7\frac{3}{4}$, $8\frac{11}{16}$, $9\frac{5}{8}$.

$$\begin{array}{ll}
\text{L. C. D.} = 16. & \\
\text{Numerators} \ldots\ldots & \left\{\begin{array}{r}12\\11\\\underline{10}\end{array}\right. \\
\text{Sum of numerators} & = 33 \\
\text{Sum of fractions} & = \tfrac{33}{16} = \qquad 2\tfrac{1}{16} \\
\text{Sum of integers} & = 7 + 8 + 9 = \underline{24} \\
 & \qquad\qquad\quad 26\tfrac{1}{16} \text{ \textit{Ans.}}
\end{array}$$

9. Find the sum of $8\frac{7}{15}$, $4\frac{4}{5}$, $3\frac{2}{3}$.

$$\begin{array}{ll}
\text{L. C. D.} = 15. & \\
\text{Numerators} \ldots\ldots & \left\{\begin{array}{r}7\\12\\\underline{10}\end{array}\right. \\
\text{Sum of numerators} & = 29 \\
\text{Sum of fractions} & = \tfrac{29}{15} \qquad = 1\tfrac{14}{15} \\
\text{Sum of integers} & = 8 + 4 + 3 = \underline{15} \\
 & \qquad\qquad\quad 16\tfrac{14}{15} \text{ \textit{Ans.}}
\end{array}$$

10. Find the sum of $4\frac{5}{9}$, $5\frac{3}{4}$, $6\frac{4}{5}$.

$$9 \times 4 \times 5 = 180 = \text{L. C. D.}$$

$$\text{Numerators} \ldots . \begin{cases} 100 \\ 135 \\ \underline{144} \end{cases}$$

$$\begin{array}{lll} \text{Sum of numerators} & = 379 & \\ \text{Sum of fractions} & = \frac{379}{180} & = 2\frac{19}{180} \\ \text{Sum of integers} & = 4 + 5 + 6 = & \underline{15} \\ & & 17\frac{19}{180} \textit{ Ans.} \end{array}$$

11. Find the sum of $9\frac{5}{6}$, $4\frac{3}{8}$, $8\frac{2}{9}$.

$$\begin{array}{r|rrr} 3 & 6 & 8 & 9 \\ \hline & \cancel{2} & 8 & 3 \end{array}$$

$$3 \times 8 \times 3 = 72 = \text{L. C. D.}$$

$$\text{Numerators} \ldots . \begin{cases} 60 \\ 27 \\ \underline{16} \end{cases}$$

$$\begin{array}{lll} \text{Sum of numerators} & = 103 & \\ \text{Sum of fractions} & = \frac{103}{72} & = 1\frac{31}{72} \\ \text{Sum of integers} & = 9 + 4 + 8 = & \underline{21} \\ & & 22\frac{31}{72} \textit{ Ans.} \end{array}$$

12. Find the sum of $4\frac{14}{15}$, $5\frac{13}{18}$, $6\frac{9}{10}$..

$$\begin{array}{r|rrr} 3 & 15 & 18 & 10 \\ \hline 2 & \cancel{5} & 6 & 10 \\ \hline & & 3 & 5 \end{array}$$

$$3 \times 2 \times 3 \times 5 = 90 = \text{L. C. D.}$$

$$\text{Numerators} \ldots . \begin{cases} 84 \\ 65 \\ \underline{81} \end{cases}$$

$$\begin{array}{lll} \text{Sum of numerators} & = 230 & \\ \text{Sum of fractions} & = \frac{230}{90} & = 2\frac{5}{9} \\ \text{Sum of integers} & = 4 + 5 + 6 = & \underline{15} \\ & & 17\frac{5}{9} \textit{ Ans.} \end{array}$$

13. Find the sum of $\frac{7}{10}$, $\frac{2}{5}$, $\frac{1}{2}$, $\frac{11}{20}$.

L. C. D. = 20.

$$\text{Numerators} \dots \left\{ \begin{array}{r} 14 \\ 8 \\ 10 \\ \underline{11} \end{array} \right.$$

Sum of numerators = 43

Sum of fractions $= \frac{43}{20} = 2\frac{3}{20}$ *Ans.*

14. Find the sum of $\frac{3}{8}$, $\frac{5}{6}$, $\frac{11}{24}$, $\frac{7}{12}$.

L. C. D. = 24.

$$\text{Numerators} \dots \left\{ \begin{array}{r} 9 \\ 20 \\ 11 \\ \underline{14} \end{array} \right.$$

Sum of numerators = 54

Sum of fractions $= \frac{54}{24} = 2\frac{1}{4}$ *Ans.*

15. Find the sum of $\frac{7}{10}$, $\frac{8}{15}$, $\frac{11}{18}$, $\frac{3}{5}$.

$$\begin{array}{r|rrrr} 5 & 10 & 15 & 18 & \cancel{5} \\ \hline & \cancel{2} & \cancel{3} & 18 & \end{array}$$

$5 \times 18 = 90 =$ L. C. D.

$$\text{Numerators} \dots \left\{ \begin{array}{r} 63 \\ 48 \\ 55 \\ \underline{54} \end{array} \right.$$

Sum of numerators = 220

Sum of fractions $= \frac{220}{90} = 2\frac{4}{9}$ *Ans.*

16. Find the sum of $\frac{11}{16}$, $\frac{13}{20}$, $\frac{3}{4}$, $\frac{7}{15}$.

$$\begin{array}{r|rrrr} 2 & 16 & 20 & \cancel{4} & 15 \\ \hline 2 & 8 & 10 & & 15 \\ \hline & 4 & \cancel{5} & & 15 \end{array}$$

$2 \times 2 \times 4 \times 15 = 240 =$ L. C. D.

$$\text{Numerators} \dots \left\{ \begin{array}{r} 165 \\ 156 \\ 180 \\ \underline{112} \end{array} \right.$$

Sum of numerators = 613

Sum of fractions $= \frac{613}{240} = 2\frac{133}{240}$ *Ans.*

17. Find the sum of $\frac{5}{9}$, $\frac{7}{12}$, $\frac{8}{15}$, $\frac{9}{20}$.

$$\begin{array}{r|rrrr} 2 & 9 & 12 & 15 & 20 \\ \hline 2 & 9 & 6 & 15 & 10 \\ \hline 3 & 9 & \cancel{3} & 15 & \cancel{5} \\ \hline & 3 & & 5 & \end{array}$$

$2 \times 2 \times 3 \times 3 \times 5 = 180 =$ L. C. D.

$$\text{Numerators} \dots \left\{ \begin{array}{r} 100 \\ 105 \\ 96 \\ \underline{81} \end{array} \right.$$

Sum of numerators = 382

Sum of fractions $= \frac{382}{180} = 2\frac{22}{180}$

$= 2\frac{11}{90}$ *Ans.*

18. Find the sum of $\frac{7}{12}$, $\frac{9}{16}$, $\frac{13}{20}$, $\frac{11}{18}$.

$$\begin{array}{r|rrrr} 2 & 12 & 16 & 20 & 18 \\ \hline 2 & 6 & 8 & 10 & 9 \\ \hline & \cancel{3} & 4 & 5 & 9 \end{array}$$

$2 \times 2 \times 4 \times 5 \times 9 = 720 =$ L. C. D.

$$\text{Numerators} \dots \left\{ \begin{array}{r} 420 \\ 405 \\ 468 \\ \underline{440} \end{array} \right.$$

Sum of numerators = 1733

Sum of fractions $= \frac{1733}{720} = 2\frac{293}{720}$ *Ans.*

19. Find the sum of $\frac{7}{8}$, $\frac{4}{9}$, $\frac{3}{4}$, $\frac{5}{6}$, $\frac{2}{3}$, $\frac{11}{15}$.

$$\begin{array}{r|rrrrrr} 2 & 8 & 9 & \cancel{4} & 6 & \cancel{3} & 15 \\ \hline 3 & 4 & 9 & & \cancel{3} & & 15 \\ \hline & 4 & 3 & & & & 5 \end{array}$$

$2 \times 3 \times 4 \times 3 \times 5 = 360 =$ L. C. D.

Numerators . . . . $\begin{cases} 315 \\ 160 \\ 270 \\ 300 \\ 240 \\ 264 \end{cases}$

Sum of numerators = 1549

Sum of fractions $= \frac{1549}{360} = 4\frac{109}{360}$

Ans.

20. Find the sum of

$\frac{8}{9}$, $\frac{7}{10}$, $\frac{3}{8}$, $\frac{13}{15}$, $\frac{5}{12}$, $\frac{17}{20}$.

$$\begin{array}{r|rrrrrr} 3 & 9 & \cancel{10} & 8 & 15 & 12 & 20 \\ \hline 2 & 3 & & 8 & \cancel{5} & \cancel{4} & 20 \\ \hline 2 & 3 & & 4 & & & 10 \\ \hline & 3 & & 2 & & & 5 \end{array}$$

$3 \times 2 \times 2 \times 3 \times 2 \times 5 = 360 =$ L. C. D.

Numerators . . . . $\begin{cases} 320 \\ 252 \\ 135 \\ 312 \\ 150 \\ 306 \end{cases}$

Sum of numerators = 1475

Sum of fractions $= \frac{1475}{360} = 4\frac{7}{72}$

Ans.

21. Find the sum of

$\frac{2}{3}$, $\frac{5}{12}$, $\frac{17}{24}$, $\frac{13}{21}$, $\frac{11}{14}$, $\frac{15}{28}$.

$$\begin{array}{r|rrrrrr} 7 & \cancel{3} & \cancel{12} & 24 & 21 & \cancel{14} & 28 \\ \hline & & & 24 & \cancel{3} & & \cancel{4} \end{array}$$

$7 \times 24 = 168 =$ L. C. D.

Numerators . . . . $\begin{cases} 112 \\ 70 \\ 119 \\ 104 \\ 132 \\ 90 \end{cases}$

Sum of numerators = 627

Sum of fractions $= \frac{627}{168} = 3\frac{41}{56}$

Ans.

22. Find the sum of

$\frac{11}{15}$, $\frac{17}{20}$, $\frac{7}{12}$, $\frac{19}{24}$, $\frac{9}{10}$, $\frac{31}{36}$.

$$\begin{array}{r|rrrrrr} 3 & 15 & 20 & \cancel{12} & 24 & \cancel{10} & 36 \\ \hline 4 & \cancel{5} & 20 & & 8 & & 12 \\ \hline & & 5 & & 2 & & 3 \end{array}$$

$3 \times 4 \times 5 \times 2 \times 3 = 360 =$ L. C. D.

Numerators . . . . $\begin{cases} 264 \\ 306 \\ 210 \\ 285 \\ 324 \\ 310 \end{cases}$

Sum of numerators = 1699

Sum of fractions $= \frac{1699}{360} = 4\frac{259}{360}$

Ans

23. Find the sum of

$\frac{14}{15}$, $\frac{17}{35}$, $\frac{23}{28}$, $\frac{19}{20}$, $\frac{13}{21}$, $\frac{19}{24}$.

$$\begin{array}{r|rrrrrr} 5 & 15 & 35 & 28 & 20 & 21 & 24 \\ \hline 3 & \cancel{3} & \cancel{7} & 28 & \cancel{4} & 21 & 24 \\ \hline & & & & & 7 & 8 \end{array}$$

$5 \times 3 \times 7 \times 8 = 840 =$ L. C. D.

Numerators . . . . $\begin{cases} 784 \\ 408 \\ 690 \\ 798 \\ 520 \\ 665 \end{cases}$

Sum of numerators = 3865

Sum of fractions $= \frac{3865}{840} = 4\frac{505}{840}$

$= 4\frac{101}{168}$ *Ans.*

24. Find the sum of $\frac{3}{4}$, $\frac{3}{8}$, $\frac{11}{20}$, $\frac{23}{28}$, $\frac{19}{21}$, $\frac{11}{14}$.

$$\begin{array}{r|rrrrrr} 4 & \cancel{4} & 8 & 20 & 28 & 21 & \cancel{14} \\ \hline & & 2 & 5 & \cancel{7} & 21 & \end{array}$$

$$4 \times 2 \times 5 \times 21 = 840 = \text{L. C. D.}$$

$$\text{Numerators} \ldots\ldots \left\{ \begin{array}{r} 630 \\ 315 \\ 462 \\ 690 \\ 760 \\ 660 \end{array} \right.$$

Sum of numerators $= 3517$

Sum of fractions $= \frac{3517}{840} = 4\frac{157}{840}$ *Ans.*

25. Find the sum of $24\frac{8}{9}$, $13\frac{4}{5}$, $36\frac{3}{8}$, $60\frac{5}{9}$, $47\frac{3}{5}$.

$$9 \quad 5 \quad 8 \quad \cancel{9} \quad \cancel{5}$$

$$9 \times 5 \times 8 = 360 = \text{L. C. D.}$$

$$\text{Numerators} \ldots\ldots \left\{ \begin{array}{r} 320 \\ 288 \\ 135 \\ 200 \\ 216 \end{array} \right. \qquad \text{Integers} \ldots \left\{ \begin{array}{r} 24 \\ 13 \\ 36 \\ 60 \\ 47 \end{array} \right.$$

Sum of numerators $= 1159$ $\qquad 180$

Sum of fractions $= \frac{1159}{360} = 3\frac{79}{360}$

Sum of integers $= \quad 180$

$183\frac{79}{360}$ *Ans.*

26. Find the sum of $35\frac{2}{3}$, $17\frac{1}{2}$, $25\frac{3}{4}$, $48\frac{3}{5}$, $18\frac{1}{2}$.

L. C. D. $= 60$.

$$\text{Numerators} \ldots\ldots \left\{ \begin{array}{r} 40 \\ 30 \\ 45 \\ 36 \\ 30 \end{array} \right. \qquad \text{Integers} \ldots \left\{ \begin{array}{r} 35 \\ 17 \\ 25 \\ 48 \\ 18 \end{array} \right.$$

Sum of numerators $= 181$ $\qquad 143$

Sum of fractions $= \frac{181}{60} = 3\frac{1}{60}$

Sum of integers $= \quad 143$

$146\frac{1}{60}$ *Ans.*

27. Find the sum of $54\frac{3}{5}$, $28\frac{2}{3}$, $16\frac{1}{2}$, $36\frac{3}{4}$, $64\frac{2}{5}$.

L. C. D. = 60.

$$\text{Numerators} \ldots \left\{\begin{array}{r} 36 \\ 40 \\ 30 \\ 45 \\ 24 \end{array}\right. \qquad \text{Integers} \ldots \left\{\begin{array}{r} 54 \\ 28 \\ 16 \\ 36 \\ 64 \end{array}\right.$$

Sum of numerators = 175 $\quad$ 198

Sum of fractions $= \frac{175}{60} = 2\frac{11}{12}$

Sum of integers = 198

$200\frac{11}{12}$ *Ans.*

28. Find the value of $36\frac{4}{7}$, $37\frac{2}{5}$, $59\frac{3}{4}$, $54\frac{2}{7}$, $16\frac{4}{5}$.

$4 \times 5 \times 7 = 140 =$ L. C. D.

$$\text{Numerators} \ldots \left\{\begin{array}{r} 80 \\ 56 \\ 105 \\ 40 \\ 112 \end{array}\right. \qquad \text{Integers} \ldots \left\{\begin{array}{r} 36 \\ 37 \\ 59 \\ 54 \\ 16 \end{array}\right.$$

Sum of numerators = 393 $\quad$ 202

Sum of fractions $= \frac{393}{140} = 2\frac{113}{140}$

Sum of integers = 202

$204\frac{113}{140}$ *Ans.*

29. Find the sum of $23\frac{5}{8}$, $32\frac{8}{9}$, $18\frac{3}{4}$, $27\frac{5}{6}$, $28\frac{2}{3}$.

L. C. D. = 72.

$$\text{Numerators} \ldots \left\{\begin{array}{r} 45 \\ 64 \\ 54 \\ 60 \\ 48 \end{array}\right. \qquad \text{Integers} \ldots \left\{\begin{array}{r} 23 \\ 32 \\ 18 \\ 27 \\ 28 \end{array}\right.$$

Sum of numerators = 271 $\quad$ 128

Sum of fractions $= \frac{271}{72} = 3\frac{55}{72}$

Sum of integers = 128

$131\frac{55}{72}$ *Ans.*

30. Find the sum of $74\frac{8}{15}$, $64\frac{13}{20}$, $48\frac{7}{12}$, $23\frac{11}{24}$, $27\frac{3}{10}$.

$$\begin{array}{r|lllll}
2 & 15 & 20 & \cancel{12} & 24 & \cancel{10} \\ \hline
2 & 15 & 10 & & 12 & \\ \hline
3 & 15 & \cancel{5} & & 6 & \\ \hline
 & 5 & & & 2 &
\end{array}$$

$$2 \times 2 \times 3 \times 5 \times 2 = 120 = \text{L. C D.}$$

$$\text{Numerators} \ldots \left\{\begin{array}{r} 64 \\ 78 \\ 70 \\ 55 \\ 36 \end{array}\right. \qquad \text{Integers} \ldots \left\{\begin{array}{r} 74 \\ 64 \\ 48 \\ 23 \\ 27 \end{array}\right.$$

$$\begin{array}{lll}
\text{Sum of numerators} = 303 & & 236 \\
\text{Sum of fractions} = \frac{303}{120} = 2\frac{63}{120} = & 2\frac{21}{40} & \\
\text{Sum of integers} = & 236 & \\ \hline
 & 238\frac{21}{40} & \textit{Ans.}
\end{array}$$

Ex. 89. Page 133.

1. Find the value of $\frac{11}{12} - \frac{5}{12}$.
$\frac{11-5}{12} = \frac{6}{12} = \frac{1}{2}$. *Ans.*

2. Find the value of $\frac{58}{63} - \frac{44}{63}$.
$\frac{58-44}{63} = \frac{14}{63} = \frac{2}{9}$. *Ans.*

3. Find the value of $\frac{83}{84} - \frac{59}{84}$.
$\frac{83-59}{84} = \frac{24}{84} = \frac{2}{7}$. *Ans.*

4. Find the value of $\frac{67}{72} - \frac{49}{72}$.
$\frac{67-49}{72} = \frac{18}{72} = \frac{1}{4}$. *Ans.*

5. Find the value of $\frac{91}{96} - \frac{73}{96}$.
$\frac{91-73}{96} = \frac{18}{96} = \frac{3}{16}$. *Ans.*

6. Find the value of $\frac{5}{6} - \frac{3}{4}$.
$\frac{10-9}{12} = \frac{1}{12}$. *Ans.*

7. Find the value of $\frac{7}{8} - \frac{3}{5}$.
$\frac{35-24}{40} = \frac{11}{40}$. *Ans.*

8. Find the value of $\frac{4}{5} - \frac{1}{6}$.
$\frac{24-5}{80} = \frac{19}{80}$. *Ans.*

9. Find the value of $\frac{7}{10} - \frac{5}{12}$.
$\frac{42-25}{60} = \frac{17}{60}$. *Ans.*

10. Find the value of $\frac{2}{3} - \frac{3}{8}$.
$\frac{16-9}{24} = \frac{7}{24}$. *Ans.*

11. Find the value of $\frac{11}{12} - \frac{3}{4}$.
$\frac{11-9}{12} = \frac{2}{12} = \frac{1}{6}$. *Ans.*

12. Find the value of $\frac{5}{7} - \frac{5}{8}$.
$\frac{40-35}{56} = \frac{5}{56}$. *Ans.*

13. Find the value of $\frac{3}{8} - \frac{5}{24}$.
$\frac{9-5}{24} = \frac{4}{24} = \frac{1}{6}$. *Ans.*

14. Find the value of $\frac{1}{11} - \frac{1}{13}$.
$\frac{13-11}{143} = \frac{2}{143}$. *Ans.*

15. Find the value of $\frac{11}{12} - \frac{5}{16}$.
$\frac{44-15}{48} = \frac{29}{48}$. *Ans.*

16. Find the value of $\frac{25}{36} - \frac{13}{64}$.
$\frac{400-117}{576} = \frac{283}{576}$. *Ans.*

17. Find the value of $\frac{2}{5} - \frac{1}{8}$.
$\frac{16-5}{40} = \frac{11}{40}$. *Ans.*

18. Find the value of $\frac{14}{15} - \frac{6}{7}$.
$\frac{98-90}{105} = \frac{8}{105}$. *Ans.*

19. Find the value of $\frac{13}{14} - \frac{19}{21}$.
$\frac{39-38}{42} = \frac{1}{42}$. *Ans.*

20. Find the value of $\frac{14}{15} - \frac{41}{50}$.
$\frac{140-123}{150} = \frac{17}{150}$. *Ans.*

21. Find the value of $\frac{19}{30} - \frac{23}{90}$.
$\frac{57-23}{90} = \frac{34}{90} = \frac{17}{45}$. *Ans.*

22. Find the value of $\frac{11}{112} - \frac{13}{168}$.
$\frac{33-26}{336} = \frac{7}{336} = \frac{1}{48}$. *Ans.*

23. Find the value of $\frac{29}{56} - \frac{3}{14}$.
$\frac{29-12}{56} = \frac{17}{56}$. *Ans.*

24. Find the value of $\frac{16}{19} - \frac{13}{16}$.
$\frac{256-247}{304} = \frac{9}{304}$. *Ans.*

25. Find the value of $14 - \frac{7}{16}$.
$13\frac{16}{16} - \frac{7}{16} = 13\frac{9}{16}$. *Ans.*

26. Find the value of $21 - \frac{19}{24}$.
$20\frac{24}{24} - \frac{19}{24} = 20\frac{5}{24}$. *Ans.*

27. Find the value of $20 - \frac{13}{20}$.
$19\frac{20}{20} - \frac{13}{20} = 19\frac{7}{20}$. *Ans.*

28. Find the value of $42 - \frac{13}{55}$.
$41\frac{55}{55} - \frac{13}{55} = 41\frac{42}{55}$. *Ans.*

29. Find the value of $25 - \frac{13}{18}$.
$24\frac{18}{18} - \frac{13}{18} = 24\frac{5}{18}$. *Ans.*

30. Find the value of $21 - \frac{13}{15}$.
$20\frac{15}{15} - \frac{13}{15} = 20\frac{2}{15}$. *Ans.*

31. Find the value of $14 - \frac{15}{32}$.
$13\frac{32}{32} - \frac{15}{32} = 13\frac{17}{32}$. *Ans.*

32. Find the value of $13 - \frac{5}{12}$.
$12\frac{12}{12} - \frac{5}{12} = 12\frac{7}{12}$. *Ans.*

33. Find the value of $24 - 13\frac{5}{8}$.
$23\frac{8}{8} - 13\frac{5}{8} = 10\frac{3}{8}$. *Ans.*

34. Find the value of $42 - 15\frac{7}{12}$.
$41\frac{12}{12} - 15\frac{7}{12} = 26\frac{5}{12}$. *Ans.*

35. Find the value of $20 - 12\frac{7}{32}$.
$19\frac{32}{32} - 12\frac{7}{32} = 7\frac{25}{32}$. *Ans.*

36. Find the value of $84 - 37\frac{17}{36}$.
$83\frac{36}{36} - 37\frac{17}{36} = 46\frac{19}{36}$. *Ans.*

37. Find the value of $21\frac{5}{18}-\frac{13}{18}$.

$20\frac{23}{18}-\frac{13}{18}=20\frac{10}{18}=20\frac{5}{9}$. *Ans.*

38. Find the value of $27\frac{5}{8}-\frac{7}{8}$.

$26\frac{13}{8}-\frac{7}{8}=26\frac{6}{8}=26\frac{3}{4}$. *Ans.*

39. Find the value of $42\frac{5}{12}-\frac{7}{12}$.

$41\frac{17}{12}-\frac{7}{12}=41\frac{10}{12}=41\frac{5}{6}$. *Ans.*

40. Find the value of $26\frac{7}{32}-\frac{19}{32}$.

$25\frac{39}{32}-\frac{19}{32}=25\frac{20}{32}=25\frac{5}{8}$. *Ans.*

41. Find the value of $43\frac{17}{24}-\frac{11}{18}$.

L. C. D. = 72.

$43\frac{17}{24}-\frac{11}{18}=43\frac{51}{72}-\frac{44}{72}=43\frac{7}{72}$. *Ans.*

42. Find the value of $27\frac{5}{12}-\frac{13}{18}$.

L. C. D. = 36.

$27\frac{5}{12}-\frac{13}{18}=27\frac{15-26}{36}=26\frac{51-26}{36}=26\frac{25}{36}$. *Ans.*

43. Find the value of $91\frac{4}{15}-\frac{7}{8}$.

L. C. D. = 120.

$91\frac{4}{15}-\frac{7}{8}=91\frac{32-105}{120}=90\frac{152-105}{120}=90\frac{47}{120}$. *Ans.*

44. Find the value of $32\frac{11}{20}-\frac{13}{15}$.

L. C. D. = 60.

$32\frac{11}{20}-\frac{13}{15}=32\frac{33-52}{60}=31\frac{93-52}{60}=31\frac{41}{60}$. *Ans.*

45. Find the value of $83\frac{7}{48}=\frac{13}{16}$.

L. C. D. = 48.

$83\frac{7}{48}-\frac{13}{16}=83\frac{7-39}{48}=82\frac{55-39}{48}=82\frac{16}{48}=82\frac{1}{3}$. *Ans.*

46. Find the value of $26\frac{3}{10}-\frac{7}{15}$.

L. C. D. = 30.

$26\frac{3}{10}-\frac{7}{15}=26\frac{9-14}{30}=25\frac{39-14}{30}=25\frac{25}{30}=25\frac{5}{6}$. *Ans.*

47. Find the value of $74\frac{5}{12}-\frac{11}{18}$.

L. C. D. = 36.

$74\frac{5}{12}-\frac{11}{18}=74\frac{15-22}{36}=73\frac{51-22}{36}=73\frac{29}{36}$. *Ans.*

48. Find the value of $68\frac{4}{9}-\frac{5}{7}$.

L. C. D. = 63.

$68\frac{4}{9}-\frac{5}{7}=68\frac{28-45}{63}=67\frac{91-45}{63}=67\frac{46}{63}$. *Ans.*

49. Find the value of $24\frac{5}{72} - 16\frac{11}{12}$.

L. C. D. = 72.

$24\frac{5}{72} - 16\frac{11}{12} = 8\frac{5-66}{72} = 7\frac{77-66}{72} = 7\frac{11}{72}$. *Ans.*

50. Find the value of $92\frac{1}{5} - 73\frac{4}{5}$.

$92\frac{1}{5} - 73\frac{4}{5} = 19\frac{1-4}{5} = 18\frac{6-4}{5} = 18\frac{2}{5}$. *Ans.*

51. Find the value of $19\frac{5}{72} - 14\frac{13}{72}$.

$19\frac{5}{72} - 14\frac{13}{72} = 5\frac{5-13}{72} = 4\frac{77-13}{72} = 4\frac{64}{72} = 4\frac{8}{9}$. *Ans.*

52. Find the value of $23\frac{1}{4} - 16\frac{3}{4}$.

$23\frac{1}{4} - 16\frac{3}{4} = 7\frac{1-3}{4} = 6\frac{5-3}{4} = 6\frac{1}{2}$. *Ans.*

53. Find the value of $15\frac{2}{3} - 12\frac{1}{4}$.

$15\frac{2}{3} - 12\frac{1}{4} = 3\frac{8-3}{12} = 3\frac{5}{12}$. *Ans.*

54. Find the value of $42\frac{1}{2} - 14\frac{1}{6}$.

$42\frac{1}{2} - 14\frac{1}{6} = 28\frac{3-1}{6} = 28\frac{1}{3}$. *Ans.*

55. Find the value of $24\frac{9}{11} - 15\frac{3}{7}$.

L. C. D. = 77.

$24\frac{9}{11} - 15\frac{3}{7} = 9\frac{63-33}{77} = 9\frac{30}{77}$. *Ans.*

56. Find the value of $72\frac{8}{9} - 28\frac{5}{6}$.

L. C. D. = 18.

$72\frac{8}{9} - 28\frac{5}{6} = 44\frac{16-15}{18} = 44\frac{1}{18}$. *Ans.*

57. Find the value of $19\frac{1}{3} - 13\frac{1}{2}$.

$19\frac{1}{3} - 13\frac{1}{2} = 6\frac{2-3}{6} = 5\frac{8-3}{6} = 5\frac{5}{6}$. *Ans.*

58. Find the value of $26\frac{3}{8} - 19\frac{2}{3}$.

$26\frac{3}{8} - 19\frac{2}{3} = 7\frac{9-16}{24} = 6\frac{33-16}{24} = 6\frac{17}{24}$. *Ans.*

59. Find the value of $45\frac{5}{12} - 26\frac{7}{10}$.

L. C. D. = 60.

$45\frac{5}{12} - 26\frac{7}{10} = 19\frac{25-42}{60} = 18\frac{85-42}{60} = 18\frac{43}{60}$. *Ans.*

60. Find the value of $34\frac{3}{8} - 16\frac{8}{9}$.

$34\frac{3}{8} - 16\frac{8}{9} = 18\frac{27-64}{72} = 17\frac{99-64}{72} = 17\frac{35}{72}$. *Ans.*

61. Find the value of $34\frac{3}{4} - 18\frac{5}{6}$.

$34\frac{3}{4} - 18\frac{5}{6} = 16\frac{9-10}{12} = 15\frac{21-10}{12} = 15\frac{11}{12}$. *Ans.*

62. Find the value of $64\frac{3}{4} - 28\frac{13}{15}$.

L. C. D. = 60.

$64\frac{3}{4} - 28\frac{13}{15} = 36\frac{45-52}{60} = 35\frac{105-52}{60} = 35\frac{53}{60}$. *Ans.*

63. Find the value of $48\frac{2}{7} - 19\frac{5}{6}$.

L. C. D. = 42.

$48\frac{2}{7} - 19\frac{5}{6} = 29\frac{12-35}{42} = 28\frac{54-35}{42} = 28\frac{19}{42}$. *Ans.*

64. Find the value of $76\frac{7}{8} - 72\frac{9}{10}$.

L. C. D. = 40.

$76\frac{7}{8} - 72\frac{9}{10} = 4\frac{35-36}{40} = 3\frac{75-36}{40} = 3\frac{39}{40}$. *Ans.*

65. Find the value of $97\frac{1}{2} - 32\frac{15}{16}$.

$97\frac{1}{2} - 32\frac{15}{16} = 65\frac{8-15}{16} = 64\frac{24-15}{16} = 64\frac{9}{16}$. *Ans.*

66. Find the value of $90\frac{1}{2} - 9\frac{5}{8}$.

$90\frac{1}{2} - 9\frac{5}{8} = 81\frac{4-5}{8} = 80\frac{12-5}{8} = 80\frac{7}{8}$. *Ans.*

67. Find the value of $78\frac{3}{10} - 56\frac{8}{9}$.

$78\frac{3}{10} - 56\frac{8}{9} = 22\frac{27-80}{90} = 21\frac{117-80}{90} = 21\frac{37}{90}$. *Ans.*

68. Find the value of $96\frac{1}{2} - 49\frac{3}{4}$.

$96\frac{1}{2} - 49\frac{3}{4} = 47\frac{2-3}{4} = 46\frac{6-3}{4} = 46\frac{3}{4}$. *Ans.*

69. Find the value of $47\frac{3}{4} - 43\frac{11}{12}$.

$47\frac{3}{4} - 43\frac{11}{12} = 4\frac{9-11}{12} = 3\frac{21-11}{12} = 3\frac{10}{12} = 3\frac{5}{6}$. *Ans.*

70. Find the value of $55\frac{3}{8} - 54\frac{2}{7}$.

$55\frac{3}{8} - 54\frac{2}{7} = 1\frac{21-16}{56} = 1\frac{5}{56}$. *Ans.*

71. Find the value of $69\frac{1}{16} - 67\frac{23}{24}$.

L. C. D. = 48.

$69\frac{1}{16} - 67\frac{23}{24} = 2\frac{3-46}{48} = 1\frac{51-46}{48} = 1\frac{5}{48}$. *Ans.*

72. Find the value of $69\frac{2}{7} - 23\frac{17}{18}$.

L. C. D. = 126.

$69\frac{2}{7} - 23\frac{17}{18} = 46\frac{36-119}{126} = 45\frac{162-119}{126} = 45\frac{43}{126}$. *Ans.*

Ex. 90. Page 134.

1. A country merchant received on Monday \$25$\frac{3}{4}$, on Tuesday \$19$\frac{7}{8}$, on Wednesday \$23$\frac{2}{3}$, on Thursday \$32$\frac{3}{8}$, on Friday \$29$\frac{1}{2}$, on Saturday \$37$\frac{5}{8}$. What had he left after paying a freight bill of \$19$\frac{3}{8}$, and to his clerk \$12$\frac{1}{2}$?

L. C. D. = 24.

$$\text{Numerators} \ldots \left\{\begin{array}{r}18\\21\\16\\9\\12\\15\end{array}\right. \qquad \text{Integers} \ldots \left\{\begin{array}{r}\$25\\19\\23\\32\\29\\37\end{array}\right.$$

$$\begin{array}{lll}\text{Sum of numerators} = 91 & & \$165\\ \text{Sum of fractions} & = \frac{91}{24} = 3\frac{19}{24} & \\ \text{Sum of integers} & = \ \underline{\$165} & \\ & \quad \$168\frac{19}{24} & \end{array}$$

$\$19\frac{3}{8} + \$12\frac{1}{2} = \$19\frac{3}{8} + \$12\frac{4}{8} = \$31\frac{7}{8}$.

$\$168\frac{19}{24} - \$31\frac{7}{8} = \$168\frac{19}{24} - \$31\frac{21}{24} = \$136\frac{22}{24} = \$136\frac{11}{12}$. *Ans.*

2. A farmer sold two loads of hay, one for \$13$\frac{1}{2}$, and the other for \$16$\frac{2}{3}$, and received \$25 down. How much is still due?

$\$13\frac{1}{2} + \$16\frac{2}{3} = \$13\frac{3}{6} + \$16\frac{4}{6} = \$29\frac{7}{6} = \$30\frac{1}{6}$.

$\$30\frac{1}{6} - \$25 = \$5\frac{1}{6}$. *Ans.*

3. A miner digs 17$\frac{2}{3}$, 19$\frac{1}{7}$, 18$\frac{3}{5}$ ounces of gold. In washing there is a loss of 3$\frac{2}{5}$ ounces. How much gold has he left?

L. C. D. = 105.

$$\text{Numerators} \ldots \left\{\begin{array}{r}70\\15\\63\end{array}\right. \qquad \text{Integers} \ldots \left\{\begin{array}{r}17\\19\\18\end{array}\right.$$

$$\begin{array}{lll}\text{Sum of numerators} = 148 & & 54\\ \text{Sum of fractions} & = \frac{148}{105} = 1\frac{43}{105} & \\ \text{Sum of integers} & = \quad \underline{54} & \\ & \quad 55\frac{43}{105} & \\ 3\frac{2}{5} = & \quad \underline{3\frac{42}{105}} & \\ & \quad 52\frac{1}{105} \text{ Ans.} & \end{array}$$

4. Henry Cameron had three wheat-fields: the first produced $217\frac{3}{7}$ bushels, the second $309\frac{5}{9}$, the third $419\frac{1}{3}$. He sent $516\frac{5}{7}$ bushels to a flour mill, and sold 193 bushels. How many bushels had he left?

L. C. D. = 63.

$$\text{Numerators} \ldots \left\{\begin{array}{r}27\\35\\21\end{array}\right. \qquad \text{Integers} \ldots \left\{\begin{array}{r}217\\309\\419\end{array}\right.$$

$$\begin{array}{lrr}
\text{Sum of numerators} = & 83 & 945\\
\text{Sum of fractions} = & \frac{83}{63} = 1\frac{20}{63} & \\
\text{Sum of integers} = & 945 & \\
\hline
& 946\frac{20}{63} & \\
516\frac{5}{7} + 193 = & 709\frac{45}{63} & \\
\hline
& 236\frac{38}{63}\ \textit{Ans.} &
\end{array}$$

5. From a piece of cloth containing $47\frac{1}{2}$ yards, $22\frac{2}{3}$ yards were sold, and then $5\frac{3}{4}$ yards were sold. How many yards remained?

$$22\tfrac{2}{3} + 5\tfrac{3}{4} = 27\tfrac{8+9}{12} = 27\tfrac{17}{12} = 28\tfrac{5}{12}.$$
$$47\tfrac{1}{2} - 28\tfrac{5}{12} = 19\tfrac{6-5}{12} = 19\tfrac{1}{12}.\ \textit{Ans.}$$

6. A grocer sold $2\frac{3}{8}$ pounds of tea to one man, $1\frac{1}{2}$ pounds more to a second man than to the first, and to a third man $1\frac{1}{4}$ pounds less than the amount he sold the first and second together. How many pounds did he sell to the second man, and how many to the third man?

$$2\tfrac{3}{8} + 1\tfrac{1}{2} = 2\tfrac{3}{8} + 1\tfrac{4}{8} = 3\tfrac{7}{8}.\ \textit{Ans.}$$
$$2\tfrac{3}{8} + 3\tfrac{7}{8} = 5\tfrac{10}{8} = 6\tfrac{1}{4}.$$
$$6\tfrac{1}{4} - 1\tfrac{1}{4} = 5.\ \textit{Ans.}$$

7. Of the prismatic spectrum red occupies $\frac{1}{8}$, orange $\frac{3}{40}$, and yellow $\frac{2}{15}$ What part of the whole do these three colors together occupy?

L. C. D. = 120.

$$\text{Numerators} \ldots \left\{\begin{array}{r}15\\9\\16\end{array}\right.$$

$$\begin{array}{ll}
\text{Sum of numerators} = & 40\\
\text{Sum of fractions} = & \frac{40}{120} = \frac{1}{3}.\ \textit{Ans.}
\end{array}$$

8. What part of a piece of cloth has a merchant sold, who has cut off and sold $\frac{3}{16}$, $\frac{5}{32}$, $\frac{9}{64}$, and $\frac{7}{40}$ of it?

$$\begin{array}{r|rrrr} 8 & \cancel{16} & \cancel{32} & 64 & 40 \\ \hline & & & 8 & 5 \end{array}$$

$8 \times 8 \times 5 = 320 =$ L. C. D.

$$\text{Numerators} \ldots \left\{ \begin{array}{r} 60 \\ 50 \\ 45 \\ 56 \\ \hline \end{array} \right.$$

Sum of numerators $= 211$

Sum of fractions $= \frac{211}{320}$. *Ans.*

9. A treasurer has expended $\frac{11}{60}$, $\frac{7}{48}$, $\frac{13}{40}$, $\frac{7}{80}$, and $\frac{5}{24}$ of a given sum. What part of the whole has he left?

$$\begin{array}{r|rrrrr} 2 & 60 & 48 & \cancel{40} & 80 & \cancel{24} \\ \hline 2 & 30 & 24 & & 40 & \\ \hline 2 & 15 & 12 & & 20 & \\ \hline 2 & 15 & 6 & & 10 & \\ \hline & 15 & \cancel{3} & & \cancel{5} & \end{array}$$

$2 \times 2 \times 2 \times 2 \times 15 = 240 =$ L. C. D.

$$\text{Numerators} \ldots \left\{ \begin{array}{r} 44 \\ 35 \\ 78 \\ 21 \\ 50 \\ \hline \end{array} \right.$$

Sum of numerators $= 228$

Sum of fractions $= \frac{228}{240} = \frac{19}{20}$.

$\frac{20}{20} - \frac{19}{20} = \frac{1}{20}$. *Ans.*

10. Of a pole $\frac{1}{5}$ is blue, $\frac{3}{7}$ red, and the rest white. What part of it is white?

$\frac{1}{5} + \frac{3}{7} = \frac{7+15}{35} = \frac{22}{35}$. $\quad \frac{35}{35} - \frac{22}{35} = \frac{13}{35}$. *Ans.*

11. A jeweller has used $\frac{3}{10}$, $\frac{7}{20}$, and $\frac{11}{40}$ of an ingot of gold. What part of it still remains?

$\frac{3}{10} + \frac{7}{20} + \frac{11}{40} = \frac{12+14+11}{40} = \frac{37}{40}$.

$\frac{40}{40} - \frac{37}{40} = \frac{3}{40}$. *Ans.*

12. A student has read $\frac{5}{21}$, $\frac{2}{7}$, and $\frac{1}{3}$ of a certain book. What part of it has he yet to read?

$\frac{5}{21} + \frac{2}{7} + \frac{1}{3} = \frac{5+6+7}{21} = \frac{18}{21} = \frac{6}{7}$.

$\frac{7}{7} - \frac{6}{7} = \frac{1}{7}$. *Ans.*

13. A traveller has gone $\frac{1}{9}$ of a journey on foot, $\frac{2}{15}$ on horseback, $\frac{1}{4}$ by rail, and the rest by coach. What part of the journey has he gone by coach?

$\frac{1}{9} + \frac{2}{15} + \frac{1}{4} = \frac{20+24+45}{180} = \frac{89}{180}$.

$\frac{180}{180} - \frac{89}{180} = \frac{91}{180}$. *Ans.*

14. Of the component elements of albumen $\frac{11}{20}$ is carbon, $\frac{7}{100}$ hydrogen, and $\frac{4}{25}$ nitrogen. What part of the whole do these elements constitute?

$$\frac{11}{20}+\frac{7}{100}+\frac{4}{25}=\frac{55+7+16}{100}=\frac{78}{100}=\frac{39}{50}. \textit{ Ans.}$$

15. Add together the greatest and least of the fractions $\frac{3}{4}$, $\frac{7}{8}$, $\frac{11}{12}$, $\frac{19}{20}$, and subtract this sum from the sum of the other two fractions.

L. C. D. = 120.

$$\frac{3}{4}=\frac{90}{120}.\quad \frac{7}{8}=\frac{105}{120}.\quad \frac{11}{12}=\frac{110}{120}.\quad \frac{19}{20}=\frac{114}{120}.$$

$$\frac{105+110}{120}-\frac{90+114}{120}=\frac{215-204}{120}=\frac{11}{120}. \textit{ Ans.}$$

16. How many tons of ore must be raised from a mine so that, on losing $\frac{17}{40}$ in roasting, and $\frac{8}{19}$ of the remainder in smelting, there may be obtained 506 tons of pure metal?

If $\frac{17}{40}$ of a ton is lost in roasting, there will be left $\frac{40}{40}-\frac{17}{40}=\frac{23}{40}$. If $\frac{8}{19}$ of the remainder is lost in smelting, there will be left $\frac{19}{19}-\frac{8}{19}=\frac{11}{19}$ of the remainder. And $\frac{11}{19}$ of $\frac{23}{40}=\frac{253}{760}$; that is, from every ton of ore there will be obtained $\frac{253}{760}$ of a ton of metal. Hence to obtain 506 tons of metal it will take $506 \div \frac{253}{760}$ tons of ore.

$$506 \div \frac{253}{760}=\frac{\overset{2}{\cancel{506}}}{1}\times\frac{760}{\cancel{253}}=1520. \textit{ Ans.}$$

17. A man invested $\frac{2}{5}$ of his capital in bank stock, $\frac{3}{4}$ of the remainder in real estate, and had left \$6000. Find his capital.

If a man invested $\frac{2}{5}$ of his capital in bank stock, he had left $\frac{3}{5}$. If he invested $\frac{3}{4}$ of the remainder in real estate, he had left $\frac{1}{4}$ of $\frac{3}{5}=\frac{3}{20}$. Hence $\frac{3}{20}$ of his property equals \$6000.

$$\$6000 \div \frac{3}{20}=\$\overset{2000}{\cancel{6000}}\times\frac{20}{\cancel{3}}=\$40{,}000. \textit{ Ans.}$$

18. A man invests $\frac{1}{2}$ of his money in land, $\frac{1}{5}$ in bank stock, $\frac{1}{6}$ in railroad stock, and has \$8000 left. What is his fortune?

$\frac{1}{2}+\frac{1}{5}+\frac{1}{6}=\frac{15+6+5}{30}=\frac{26}{30}=\frac{13}{15}$, the amount invested. Then there is left $\frac{2}{15}$. Hence \$8000 = $\frac{2}{15}$ of his property.

$$\$8000 \div \frac{2}{15}=\$\overset{4000}{\cancel{8000}}\times\frac{15}{\cancel{2}}=\$60{,}000. \textit{ Ans.}$$

19. A owns $\frac{2}{5}$ of a ship, and B the remainder; and $\frac{3}{4}$ of the difference between their shares is \$1500. What is the value of the ship?

If A owns $\frac{2}{5}$ of a ship and B the remainder, then B owns $\frac{3}{5}$.
$\frac{3}{5} - \frac{2}{5} = \frac{1}{5}$, the difference between the shares of A and B.
$\frac{3}{4}$ of $\frac{1}{5} = \frac{3}{20}$. Hence \$1500 = $\frac{3}{20}$ of the value of the whole ship.

$$\$1500 \div \frac{3}{20} = \$\overset{500}{\cancel{1500}} \times \frac{20}{\cancel{3}} = \$10{,}000. \textit{ Ans.}$$

Ex. 91. Page 136.

Reduce to simple fractions:

1. $\frac{6}{8\frac{1}{2}} \times \frac{2}{2} = \frac{12}{17}$. *Ans.*

2. $\frac{7}{11\frac{3}{4}} \times \frac{4}{4} = \frac{28}{47}$. *Ans.*

3. $\frac{9}{12\frac{3}{5}} \times \frac{5}{5} = \frac{45}{63} = \frac{5}{7}$. *Ans.*

4. $\frac{11}{13\frac{4}{7}} \times \frac{7}{7} = \frac{77}{95}$. *Ans.*

5. $\frac{4\frac{7}{9}}{7} \times \frac{9}{9} = \frac{43}{63}$. *Ans.*

6. $\frac{\frac{2}{3}}{\frac{4}{5}} \times \frac{15}{15} = \frac{10}{12} = \frac{5}{6}$. *Ans.*

7. $\frac{\frac{4}{9}}{\frac{7}{10}} \times \frac{90}{90} = \frac{40}{63}$ *Ans.*

8. $\frac{\frac{10}{11}}{\frac{12}{13}} \times \frac{143}{143} = \frac{130}{132} = \frac{65}{66}$. *Ans.*

9. $\frac{\frac{6}{7}}{\frac{14}{23}} \times \frac{161}{161} = \frac{138}{98} = 1\frac{40}{98} = 1\frac{20}{49}$. *Ans.*

10. $\frac{\frac{15}{19}}{\frac{45}{76}} \times \frac{76}{76} = \frac{60}{45} = 1\frac{1}{3}$. *Ans.*

11. $\frac{\frac{13}{14}}{7\frac{4}{5}} \times \frac{70}{70} = \frac{65}{546} = \frac{5}{42}$. *Ans.*

12. $\frac{5\frac{3}{4}}{6\frac{2}{9}} \times \frac{36}{36} = \frac{207}{224}$. *Ans.*

13. $\frac{19\frac{3}{4}}{28\frac{7}{18}} \times \frac{36}{36} = \frac{711}{1022}$. *Ans.*

14. $\frac{2\frac{8}{11}}{7\frac{3}{4}} \times \frac{44}{44} = \frac{120}{341}$ *Ans.*

15. $\frac{23\frac{7}{9}}{24\frac{5}{6}} \times \frac{18}{18} = \frac{428}{447}$. *Ans.*

16. $\frac{\frac{3}{4} \text{ of } 3\frac{1}{2}}{\frac{4}{5} \text{ of } 9\frac{2}{3}} = \frac{\frac{3}{4} \times \frac{7}{2}}{\frac{4}{5} \times \frac{29}{3}} = \frac{\frac{21}{8}}{\frac{116}{15}} = \frac{21}{8} \times \frac{15}{116} = \frac{315}{928}$. *Ans.*

17. $\frac{\frac{2}{5} \text{ of } 13\frac{1}{4}}{\frac{4}{7} \text{ of } 7\frac{7}{8}} = \frac{\frac{\cancel{2}}{5} \times \frac{53}{\underset{2}{\cancel{4}}}}{\frac{\cancel{4}}{\cancel{7}} \times \frac{\overset{9}{\cancel{63}}}{\underset{2}{\cancel{8}}}} = \frac{\frac{53}{10}}{\frac{9}{2}} = \frac{53}{\underset{5}{\cancel{10}}} \times \frac{\cancel{2}}{9} = \frac{53}{45} = 1\frac{8}{45}$. *Ans.*

18. $\dfrac{\frac{2}{11}\text{ of }12\frac{6}{7}}{\frac{3}{8}\text{ of }\frac{5}{6\frac{2}{3}}}=\dfrac{\frac{2}{11}\times\frac{90}{7}}{\frac{3}{8}\times\frac{\overset{3}{\cancel{15}}}{\underset{4}{\cancel{20}}}}=\dfrac{\frac{180}{77}}{\frac{9}{32}}=\dfrac{\overset{20}{\cancel{180}}}{77}\times\dfrac{32}{\cancel{9}}=\dfrac{640}{77}=8\frac{24}{77}.$ *Ans.*

19. $\dfrac{\frac{3}{4}\text{ of }\frac{2}{7}}{\frac{4}{7\frac{1}{2}}\text{ of }\frac{8}{11}}=\dfrac{\frac{3}{\cancel{4}}\times\frac{\cancel{2}}{7}}{\frac{8}{15}\times\frac{8}{11}}=\dfrac{\frac{3}{14}}{\frac{64}{165}}=\dfrac{3}{14}\times\dfrac{165}{64}=\dfrac{495}{896}.$ *Ans.*

20. $\dfrac{\frac{\frac{2}{3}}{\frac{3}{4}}}{5}=\dfrac{\frac{2}{3}\times\frac{4}{3}}{5}=\dfrac{\frac{8}{9}}{5}=\dfrac{8}{9}\times\dfrac{1}{5}=\dfrac{8}{45}.$ *Ans.*

21. $\dfrac{2}{\frac{\frac{3}{4}}{\frac{5}{9}}}=\dfrac{2}{\frac{3}{4}\times\frac{9}{5}}=\dfrac{2}{\frac{27}{20}}=\dfrac{2}{1}\times\dfrac{20}{27}=\dfrac{40}{27}=1\frac{13}{27}.$ *Ans.*

Ex. 92. Page 137.

1. What fraction of 8 is 7?

$\frac{7}{8}$. *Ans.*

2. What fraction of 7 is 8?

$\frac{8}{7}$. *Ans.*

3. What fraction of 6 is 2?

$\frac{2}{6}=\frac{1}{3}$. *Ans.*

4. What fraction of 5 is 3?

$\frac{3}{5}$. *Ans.*

5. What fraction of 7 is 15?

$\frac{15}{7}$. *Ans.*

6. What fraction of 15 is 7?

$\frac{7}{15}$. *Ans.*

7. What fraction of $2\frac{1}{2}$ is $\frac{1}{2}$?

$\dfrac{\frac{1}{2}}{2\frac{1}{2}}\times\dfrac{2}{2}=\dfrac{1}{5}.$ *Ans.*

8. What fraction of $\frac{3}{4}$ is $4\frac{1}{4}$?

$\dfrac{4\frac{1}{4}}{\frac{3}{4}}\times\dfrac{4}{4}=\dfrac{17}{3}.$ *Ans.*

9. What fraction of $2\frac{3}{4}$ is $1\frac{1}{4}$?

$\dfrac{1\frac{1}{4}}{2\frac{3}{4}}\times\dfrac{4}{4}=\dfrac{5}{11}.$ *Ans.*

10. What fraction of $2\frac{1}{3}$ is $5\frac{2}{3}$?

$\dfrac{5\frac{2}{3}}{2\frac{1}{3}}\times\dfrac{3}{3}=\dfrac{17}{7}.$ *Ans.*

11. What fraction of $2\frac{1}{3}$ is $5\frac{1}{4}$?

$$\frac{5\frac{1}{4}}{2\frac{1}{3}}\times\frac{12}{12}=\frac{63}{28}=\frac{9}{4}.\ \textit{Ans.}$$

12. What fraction of $5\frac{1}{4}$ is $2\frac{1}{3}$?

$$\frac{2\frac{1}{3}}{5\frac{1}{4}}\times\frac{12}{12}=\frac{28}{63}=\frac{4}{9}.\ \textit{Ans.}$$

13. What fraction of $3\frac{3}{4}$ is $\frac{7}{8}$?

$$\frac{\frac{7}{8}}{3\frac{3}{4}}\times\frac{8}{8}=\frac{7}{30}.\ \textit{Ans.}$$

14. What fraction of $5\frac{1}{4}$ is $4\frac{2}{3}$?

$$\frac{4\frac{2}{3}}{5\frac{1}{4}}\times\frac{12}{12}=\frac{56}{63}=\frac{8}{9}.\ \textit{Ans.}$$

15. What fraction of $11\frac{3}{4}$ is $5\frac{2}{9}$?

$$\frac{5\frac{2}{9}}{11\frac{3}{4}}\times\frac{36}{36}=\frac{188}{423}=\frac{4}{9}.\ \textit{Ans.}$$

16. What fraction of $2\frac{17}{19}$ is $7\frac{6}{7}$?

$$\frac{7\frac{6}{7}}{2\frac{17}{19}}\times\frac{133}{133}=\frac{1055}{385}=\frac{19}{7}.\ \textit{Ans.}$$

17. What fraction of $3\frac{11}{12}$ is $9\frac{2}{5}$?

$$\frac{9\frac{2}{5}}{3\frac{11}{12}}\times\frac{60}{60}=\frac{564}{235}=\frac{12}{5}.\ \textit{Ans.}$$

18. What fraction of $14\frac{2}{3}$ is $4\frac{8}{9}$?

$$\frac{4\frac{8}{9}}{14\frac{2}{3}}\times\frac{9}{9}=\frac{44}{132}=\frac{1}{3}.\ \textit{Ans.}$$

19. What fraction of $7\frac{3}{4}$ is $2\frac{1}{8}$?

$$\frac{2\frac{1}{8}}{7\frac{3}{4}}\times\frac{8}{8}=\frac{17}{62}.\ \textit{Ans.}$$

20. What fraction of $7\frac{1}{2}$ is $\frac{15}{19}$?

$$\frac{\frac{15}{19}}{7\frac{1}{2}}\times\frac{38}{38}=\frac{30}{285}=\frac{2}{19}.\ \textit{Ans.}$$

21. What fraction of $\frac{3}{4}$ of $10\frac{1}{3}$ is $\frac{31}{32}$?

$$\frac{\frac{31}{32}}{\frac{3}{4}\text{ of }10\frac{1}{3}}=\frac{\frac{31}{32}}{\frac{\cancel{3}}{4}\text{ of }\frac{31}{\cancel{3}}}=\frac{\frac{31}{32}}{\frac{31}{4}}=\frac{\cancel{31}}{\underset{8}{\cancel{32}}}\times\frac{\cancel{4}}{\cancel{31}}=\frac{1}{8}.\ \textit{Ans.}$$

22. What fraction of $\frac{7}{9}$ of $25\frac{7}{8}$ is $\frac{161}{162}$?

$$\frac{\frac{161}{162}}{\frac{7}{9}\text{ of }25\frac{7}{8}}=\frac{\frac{161}{162}}{\frac{7}{\cancel{9}}\text{ of }\frac{\overset{23}{\cancel{207}}}{8}}=\frac{\frac{161}{162}}{\frac{161}{8}}=\frac{\cancel{161}}{\underset{81}{\cancel{162}}}\times\frac{\overset{4}{\cancel{8}}}{\cancel{161}}=\frac{4}{81}.\ \textit{Ans.}$$

23. What fraction of $\frac{2}{3}$ of $12\frac{3}{4}$ is $\frac{51}{55}$?

$$\frac{\frac{51}{55}}{\frac{2}{3}\text{ of }12\frac{3}{4}}=\frac{\frac{51}{55}}{\frac{\cancel{2}}{\cancel{3}}\text{ of }\frac{\overset{17}{\cancel{51}}}{\underset{2}{\cancel{4}}}}=\frac{\frac{51}{55}}{\frac{17}{2}}=\frac{\overset{3}{\cancel{51}}}{55}\times\frac{2}{\cancel{17}}=\frac{6}{55}.\ \textit{Ans.}$$

24. What fraction of $\frac{6}{7}$ of $3\frac{1}{6}$ is $\frac{19}{44}$?

$$\frac{\frac{19}{44}}{\frac{6}{7}\text{ of }3\frac{1}{6}}=\frac{\frac{19}{44}}{\frac{\cancel{6}}{7}\text{ of }\frac{19}{\cancel{6}}}=\frac{\frac{19}{44}}{\frac{19}{7}}=\frac{\cancel{19}}{44}\times\frac{7}{\cancel{19}}=\frac{7}{44}.\ \textit{Ans.}$$

25. What fraction of $\frac{22}{35}$ of $7\frac{1}{2}$ is $3\frac{2}{3}$?

$$\frac{3\frac{2}{3}}{\frac{22}{35}\text{ of }7\frac{1}{2}}=\frac{3\frac{2}{3}}{\frac{\overset{11}{\cancel{22}}}{\underset{7}{\cancel{35}}}\text{ of }\frac{\overset{3}{\cancel{15}}}{\cancel{2}}}=\frac{3\frac{2}{3}}{\frac{33}{7}}=\frac{\cancel{11}}{3}\times\frac{7}{\underset{3}{\cancel{33}}}=\frac{7}{9}.\ \textit{Ans.}$$

26. What fraction of $\frac{7}{26}$ is $\frac{1}{4}$ of $\frac{14}{15}$?

$$\frac{\frac{1}{\underset{2}{\cancel{4}}}\text{ of }\frac{\overset{7}{\cancel{14}}}{15}}{\frac{7}{26}}=\frac{\frac{7}{30}}{\frac{7}{26}}=\frac{\cancel{7}}{\underset{15}{\cancel{30}}}\times\frac{\overset{13}{\cancel{26}}}{\cancel{7}}=\frac{13}{15}.\ \textit{Ans.}$$

27. What fraction of $\frac{7}{9}$ is $\frac{1}{6}$ of $2\frac{3}{4}$?

$$\frac{\frac{1}{6}\text{ of }2\frac{3}{4}}{\frac{7}{9}}=\frac{\frac{1}{6}\times\frac{11}{4}}{\frac{7}{9}}=\frac{\frac{11}{24}}{\frac{7}{9}}=\frac{11}{\underset{8}{\cancel{24}}}\times\frac{\overset{3}{\cancel{9}}}{7}=\frac{33}{56}.\ \textit{Ans.}$$

28. What fraction of 33 is $2\frac{1}{3}$ of $2\frac{1}{7}$?

$$\frac{2\frac{1}{3}\text{ of }2\frac{1}{7}}{33}=\frac{\frac{\cancel{7}}{\cancel{3}}\times\frac{\overset{5}{\cancel{15}}}{\cancel{7}}}{33}=\frac{5}{33}.\ \textit{Ans.}$$

29. What fraction of $27\frac{17}{24}$ is $2\frac{43}{45}$ of $1\frac{1}{14}$?

$$\frac{2\frac{43}{45}\text{ of }1\frac{1}{14}}{27\frac{17}{24}}=\frac{\frac{133}{\underset{3}{\cancel{45}}}\times\frac{\cancel{15}}{14}}{27\frac{17}{24}}=\frac{\frac{133}{42}}{27\frac{17}{24}}=\frac{\cancel{133}}{\underset{7}{\cancel{42}}}\times\frac{\overset{4}{\cancel{24}}}{\underset{5}{\cancel{665}}}=\frac{4}{35}.\ \textit{Ans.}$$

30. What fraction of 36 is $3\frac{3}{8}$ of $6\frac{2}{5}$?

$$\frac{3\frac{3}{8}\text{ of }6\frac{2}{5}}{36}=\frac{\frac{27}{\cancel{8}}\times\frac{\overset{4}{\cancel{32}}}{5}}{36}=\frac{\frac{108}{5}}{36}=\frac{\overset{3}{\cancel{108}}}{5}\times\frac{1}{\cancel{36}}=\frac{3}{5}.\ \textit{Ans.}$$

Ex. 93. Page 138.

Reduce to common fractions:

1. $0.5=\frac{5}{10}=\frac{1}{2}$. *Ans.*
2. $0.06=\frac{6}{100}=\frac{3}{50}$. *Ans.*
3. $0.15=\frac{15}{100}=\frac{3}{20}$. *Ans.*
4. $0.025=\frac{25}{1000}=\frac{1}{40}$. *Ans.*
5. $0.7=\frac{7}{10}$. *Ans.*
6. $0.19=\frac{19}{100}$. *Ans.*
7. $0.135=\frac{135}{1000}=\frac{27}{200}$. *Ans.*
8. $0.005=\frac{5}{1000}=\frac{1}{200}$. *Ans.*
9. $0.015=\frac{15}{1000}=\frac{3}{200}$. *Ans.*
10. $0.18=\frac{18}{100}=\frac{9}{50}$. *Ans.*
11. $0.125=\frac{125}{1000}=\frac{1}{8}$. *Ans.*
12. $0.004=\frac{4}{1000}=\frac{1}{250}$. *Ans.*
13. $0.032=\frac{32}{1000}=\frac{4}{125}$. *Ans.*
14. $0.3125=\frac{3125}{10000}=\frac{5}{16}$. *Ans.*
15. $0.0625=\frac{625}{10000}=\frac{1}{16}$. *Ans.*
16. $0.0425=\frac{425}{10000}=\frac{17}{400}$. *Ans.*
17. $0.7168=\frac{7168}{10000}=\frac{448}{625}$. *Ans.*
18. $3.02=3\frac{2}{100}=3\frac{1}{50}$. *Ans.*
19. $5.85=5\frac{85}{100}=5\frac{17}{20}$. *Ans.*
20. $7.075=7\frac{75}{1000}=7\frac{3}{40}$. *Ans.*
21. $0.15625=\frac{15625}{100000}=\frac{5}{32}$. *Ans.*
22. $0.46875=\frac{46875}{100000}=\frac{15}{32}$. *Ans.*
23. $0.00256=\frac{256}{100000}=\frac{8}{3125}$. *Ans.*
24. $0.00375=\frac{375}{100000}=\frac{3}{800}$. *Ans.*
25. $1.6125=1\frac{6125}{10000}=1\frac{49}{80}$. *Ans.*
26. $8.0396=8\frac{396}{10000}=8\frac{99}{2500}$. *Ans.*
27. $2.18375=2\frac{18375}{100000}=2\frac{147}{800}$. *Ans.*
28. $1.0725=1\frac{725}{10000}=1\frac{29}{400}$. *Ans.*
29. $22.848=22\frac{848}{1000}=22\frac{106}{125}$. *Ans.*
30. $1.30125=1\frac{30125}{100000}=1\frac{241}{800}$. *Ans.*
31. $17.875=17\frac{875}{1000}=17\frac{7}{8}$. *Ans.*
32. $2.9375=2\frac{9375}{10000}=2\frac{15}{16}$. *Ans.*

Ex. 94. Page 139.

Change the following fractions to decimals:

1. $\frac{13}{32}$.

$$\begin{array}{r@{}l}
 & \underline{\;0.40625} \\
32) & 13.0000 \\
 & \underline{128} \\
 & 200 \\
 & \underline{192} \\
 & 80 \\
 & \underline{64} \\
 & 160 \\
 & \underline{160}
\end{array}$$

0.40625. *Ans.*

2. $\frac{23}{200}$.

$$\begin{array}{r@{}l}
200) & \underline{23.000} \\
 & 0.115
\end{array}$$

0.115. *Ans.*

3. $\frac{39}{4000}$.

$$\begin{array}{r@{}l}
4\cancel{000}) & \underline{39.00\cancel{000}} \\
 & 0.00975
\end{array}$$

0.00975. *Ans.*

4. $16\frac{9}{40}$. $40\overline{)9.000}$

0.225

16.225. *Ans.*

5. $11\frac{67}{80}$. $80\overline{)67.0000}$

0.8375

11.8375. *Ans.*

6 $\frac{11}{8}$. $8\overline{)11.000}$

1.375

1.375. *Ans.*

7. $\frac{3}{500}$. $500\overline{)3.000}$

0.006

0.006. *Ans.*

8. $5\frac{3}{64}$.

$$\begin{array}{r}
0.046875 \\
64\overline{)3.000000} \\
\underline{256} \\
440 \\
\underline{384} \\
560 \\
\underline{512} \\
480 \\
\underline{448} \\
320 \\
\underline{320}
\end{array}$$

5.046875. *Ans.*

9. $\frac{17}{16}$.

$$\begin{array}{r}
1.0625 \\
16\overline{)17.0000} \\
\underline{16} \\
100 \\
\underline{96} \\
40 \\
\underline{32} \\
80 \\
\underline{80}
\end{array}$$

1.0625. *Ans.*

10. $\frac{9}{5}$. $5\overline{)9.0}$

1.8

1.8. *Ans.*

11. $\frac{19}{20}$. $20\overline{)19.00}$

0.95

0.95. *Ans.*

12. $\frac{377}{4}$. $4\overline{)377.00}$

94.25

94.25. *Ans.*

13. $\frac{9}{16}$.

$$\begin{array}{r}
0.5625 \\
16\overline{)9.0000} \\
\underline{80} \\
100 \\
\underline{96} \\
40 \\
\underline{32} \\
80 \\
\underline{80}
\end{array}$$

0.5625. *Ans.*

14. $11\frac{18}{625}$.

$$\begin{array}{r}
0.0288 \\
625\overline{)18.0000} \\
\underline{1250} \\
5500 \\
\underline{5000} \\
5000 \\
\underline{5000}
\end{array}$$

11.0288 *Ans.*

15. $14\frac{79}{4000}$ $4000\overline{)79.00000}$

0.01975

14.01975. *Ans.*

Express the following as decimals to five places:

16. $\frac{1}{6}$.
6)1.00000
0.16667

0.16667. *Ans.*

17. $\frac{1}{7}$.
7)1.00000
0.14286

0.14286. *Ans.*

18. $\frac{1}{9}$.
9)1.00000
0.11111

0.11111. *Ans.*

19. $\frac{2}{11}$.
0.18181
11)2.00000
11
90
88
20
11
90
88
20
11
9

0.18182. *Ans.*

20. $\frac{13}{28}$.
0.46428
28)13.00000
112
180
168
120
112
80
56
240
224
16

0.46429. *Ans.*

21. $\frac{4}{9}$.
9)4.00000
0.44444

0.44444. *Ans.*

22. $\frac{12}{13}$.
0.92307
13)12.00000
117
30
26
40
39
100
91
9

0.92308. *Ans.*

23. $\frac{167}{240}$.
0.69583
$24\cancel{0}$)167.0000$\cancel{0}$
144
230
216
140
120
200
192
80
72
8

0.69583. *Ans.*

24. $\frac{7}{111}$.
0.06306
111)7.00000
666
340
333
700
666
34

0.06306. *Ans.*

25. $\frac{71}{82}$.

$$\begin{array}{r} 0.86585 \\ 82)\overline{71.00000} \\ \underline{656} \\ 540 \\ \underline{492} \\ 480 \\ \underline{410} \\ 700 \\ \underline{656} \\ 440 \\ \underline{410} \\ 30 \end{array}$$

0.86585. *Ans.*

26. $\frac{311}{328}$.

$$\begin{array}{r} 0.94817 \\ 328)\overline{311.00000} \\ \underline{2952} \\ 1580 \\ \underline{1312} \\ 2680 \\ \underline{2624} \\ 560 \\ \underline{328} \\ 2320 \\ \underline{2296} \\ 24 \end{array}$$

0.94817. *Ans.*

27. $4\frac{29}{440}$.

$$\begin{array}{r} 0.06590 \\ 44\cancel{0})\overline{29.00000} \\ \underline{264} \\ 260 \\ \underline{220} \\ 400 \\ \underline{396} \\ 40 \end{array}$$

4.06591. *Ans.*

Ex. 95. Page 140.

Solve the following problems, first changing the common fractions to decimals:

1. A person owed $24,560. When he has paid 8345\frac{3}{10}$, 7234\frac{3}{10}$, 6472\frac{9}{20}$, how much does he still owe?

$\frac{3}{10} = 0.3.$

$\frac{9}{20} = 0.45.$

$$\begin{array}{r} \$8345.30 \\ 7234.30 \\ \underline{6472.45} \\ \$22,052.05 \end{array}$$

$$\begin{array}{r} \$24,560.00 \\ \underline{22,052.05} \\ \$2507.95 \end{array}$$ *Ans.*

2. A man sold 46$\frac{17}{20}$ acres of land, at the rate of 9\frac{1}{2}$ an acre, and 54$\frac{1}{2}$ acres at the rate of 2\frac{19}{20}$. How much did he receive for the whole?

$\frac{17}{20} = 0.85.$ $\frac{19}{20} = 0.95.$ $\frac{1}{2} = 0.5.$

$$\begin{array}{r} 46.85 \\ \underline{9.50} \\ 234250 \\ \underline{42165} \\ 445.0750 \end{array}$$

$$\begin{array}{r} 54.5 \\ \underline{2.95} \\ 2725 \\ 4905 \\ \underline{1090} \\ 160.775 \end{array}$$

$$\begin{array}{r} \$445.075 \\ \underline{160.775} \\ \$605.850. \end{array}$$ *Ans.*

3. A merchant purchases 346 pieces of cloth, each containing $32\frac{3}{4}$ yards, at $\$1\frac{3}{4}$ a yard, and sells the whole for $\$2\frac{9}{20}$ a yard. What does he gain?

$\frac{3}{4} = 0.75$, $\frac{9}{20} = 0.45$.

$$\begin{array}{r} 32.75 \\ \underline{346} \\ 19650 \\ 13100 \\ \underline{9825} \\ 11{,}331.50 \text{ yards.} \end{array}$$

$$\begin{array}{r} \$2.45 \\ \underline{1.75} \\ \$0.70 \end{array} = \text{gain on one yard.}$$

$$\begin{array}{r} 11331.5 \\ \underline{.70} \\ 7932.050 \end{array}$$

\$7932.05. *Ans.*

4. A merchant purchased 8 yards of cloth at $\$6\frac{1}{2}$ a yard. What sum will he gain per yard if he sells the whole piece for $\$56\frac{24}{25}$?

$\frac{1}{2} = 0.5$.

$$\begin{array}{r} 0.96 \\ 25)\overline{24.0} \\ \underline{225} \\ 150 \\ \underline{150} \end{array}$$

$$\begin{array}{r} \$6.50 \\ \underline{8} \\ \$52.00 \end{array} = \text{cost.}$$

$$\begin{array}{r} \$56.96 \\ \underline{52.00} \\ 8)\$4.96 \\ \$0.62 \end{array} \begin{array}{l} \\ \\ = \text{gain.} \\ \textit{Ans.} \end{array}$$

5. A man bought a piece of land for $\$1046\frac{1}{4}$ at the rate of $\$15\frac{1}{2}$ an acre. He sells it for $\$17\frac{1}{5}$ an acre. How much does he gain on the whole?

$\frac{1}{4} = 0.25$, $\frac{1}{2} = 0.5$, $\frac{1}{5} = 0.2$.

$$\begin{array}{r} 67.5 \\ 155)\overline{10462.5} \\ \underline{930} \\ 1162 \\ \underline{1085} \\ 775 \\ \underline{775} \end{array}$$

$$\begin{array}{r} \$17.20 \\ \underline{15.50} \\ \$1.70 \end{array} = \text{gain on one acre.}$$

$$\begin{array}{r} 67.5 \\ \underline{1.70} \\ 47250 \\ \underline{675} \\ 114.750 \end{array}$$

\$114.75. *Ans.*

6. A merchant purchased 15 casks of wine of 25 gallons each. He paid \$980 for the wine, $\$78\frac{3}{4}$ tax, $\$33\frac{3}{5}$ for transportation. He sold it for $\$3\frac{4}{5}$ a gallon. How much did he gain?

$\frac{3}{4} = 0.75$, $\frac{3}{5} = 0.6$, $\frac{4}{5} = 0.8$.

$$\begin{array}{l} 25 \\ \underline{15} \\ 125 \\ \underline{25} \\ 375 = \text{number of gallons.} \end{array}$$

$$\begin{array}{r} \$980. \\ 78.75 \\ \underline{33.60} \\ \$1092.35 \end{array} = \text{cost.}$$

$$\begin{array}{r} 375 \\ \underline{3.80} \\ 30000 \\ \underline{11250} \\ 1425.00 \end{array}$$

$$\begin{array}{r} \$1425. \\ \underline{1092.35} \\ \$332.65 \end{array} \begin{array}{l} = \text{what he received.} \\ = \text{cost.} \\ = \text{gain. } \textit{Ans.} \end{array}$$

7. A speculator purchased 738 acres of land for $21,294. He sells $\frac{2}{5}$ of his land at the rate of 34\frac{3}{4}$ an acre, and the rest at the rate of $35 per acre. What does he gain?

$\frac{2}{5} = 0.4$, $\frac{3}{4} = 0.75$.

738
0.4
295.2 = $\frac{2}{5}$ of the whole number of acres.
34.75
14760
20664
11808
8856
10258.200

$10,258.20 = what was received for $\frac{2}{5}$.

738
295.2
442.8 = remaining number of acres.
35
22140
13284
15498.0

$15,498 = what was received for remaining acres.
10,258.20
$25,756.20 = what was received for the whole.
21,294.00
$4,462.20 = gain. *Ans.*

8. A piece of cloth is 29$\frac{3}{4}$ yards in length. How many pieces, each containing 1$\frac{55}{64}$ yards, can be cut from it?

$\frac{55}{64} = 0.859375$, $\frac{3}{4} = 0.75$.

0.859375
64)55.0
512
380
320
600
576
240
192
480
448
320
320

16
1859375)29750000
1859375
11156250
11156250

16. *Ans.*

9. How many postage-stamps, each containing $\frac{18}{25}$ of a square inch, are in a sheet of $172\frac{4}{5}$ square inches?

```
      0.72                        240
  25)18.0                   72)17280
     175                       144
      50                        288
      50                        288
```

$\frac{18}{25}$ = 0.72, $\frac{4}{5}$ = 0.8.

240. *Ans.*

10. Of a boat worth $5600, A, who has $\frac{17}{64}$, sells $\frac{3}{4}$ of his share to B, and B sells $\frac{4}{5}$ of his share to C. Find the value of C's share.

```
     0.265625               0.265625
 64)17.0                         .75
    128                      1328125
     420                    1859375
     384                   0.19921875 = B's.
      360                         0.8
      320                 0.159375000 = C's.
       400
       384
        160
        128
         320
         320
```

$\frac{17}{64}$ = 0.265625, $\frac{3}{4}$ = 0.75, $\frac{4}{5}$ = 0.8.

If the whole boat is worth $5600, C's share will be worth

0.159375 × $5600.

```
 0.159375
     5600
 95625000
79687500
892.500000
```

$892.50. *Ans.*

11. From Montreal to Toronto, by the Grand Trunk Railway, the distance is 332 miles. One-half a mile more than $\frac{3}{8}$ of this distance was opened in November, 1855, and the remainder in November, 1856. Find the number of miles opened in 1856.

$\frac{3}{8}$ = 0.375, $\frac{1}{2}$ = 0.5.

```
    332
  0.375
   1660
  2324
 996
124.500 = 3/8 of the distance.
     .5
125.0   = number of miles opened Nov., 1855.
    332
    125
    207 = number of miles opened Nov., 1856. Ans.
```

12. The 36 Israelites who fell in the first assault on Ai were $\frac{3}{250}$ of the force sent by Joshua. How many were sent by Joshua?

$$\begin{array}{r} 0.012 \\ 250\overline{)3.00} \\ \underline{250} \\ 500 \\ \underline{500} \end{array} \qquad \begin{array}{r} 3000 \\ 12\overline{)36000} \\ \underline{36} \\ \\ 3000.\ \textit{Ans.} \end{array}$$

If 36 = 0.012, whole number = 36 ÷ 0.012.

13. What number multiplied by $8\frac{2}{5}$ equals $3\frac{1}{2} + \frac{1}{4} + \frac{16}{25} + \frac{43}{50}$?

$$\begin{array}{r} 3\frac{1}{2} = 3.5 \\ \frac{1}{4} = 0.25 \\ \frac{16}{25} = 0.64 \\ \frac{43}{50} = \underline{0.86} \\ 5.25 \end{array} \qquad \begin{array}{r} 8\frac{2}{5} = 8.4. \\ 0.625 \\ 84\overline{)52.5} \\ \underline{504} \\ 210 \\ \underline{168} \\ 420 \\ \underline{420} \\ 0.625.\ \textit{Ans.} \end{array}$$

14. Multiply the sum of $\frac{9}{10}$ and $\frac{3}{4}$ by their difference.

$$\begin{array}{lr} & \frac{9}{10} = 0.9 \\ & \frac{3}{4} = \underline{0.75} \\ \text{Sum} & = 1.65 \\ \text{Difference} & = \underline{0.15} \\ & 825 \\ & \underline{165} \\ & 0.2475\ \textit{Ans.} \end{array}$$

15. Of the distance from Edinburgh to London by rail, that from Edinburgh to Carlisle is $\frac{1}{4}$, from Carlisle to Preston $\frac{9}{40}$, while that from Preston to London is 210 miles. Find the distance from Edinburgh to London.

$$\begin{array}{r} 4\cancel{0})\underline{9.\cancel{0}} \\ 0.225 \end{array}$$

$$\begin{array}{r} \frac{9}{40} = 0.225 \\ \frac{1}{4} = \underline{0.25} \\ 0.475 \end{array}$$

$$\begin{array}{l} 1.000 \\ \underline{0.475} \\ 0.525 = 210 \text{ miles.} \end{array}$$

$$\begin{array}{r} 400 \\ 525\overline{)210000} \\ \underline{2100} \\ 400.\ \textit{Ans.} \end{array}$$

16. How many times can a measure holding $\frac{7}{8}$ of a pint be filled from a vessel containing $63\frac{7}{8}$ pints?

$$\frac{7}{8} = 0.875.$$

$$\begin{array}{r} 73 \\ 875\overline{)63875} \\ \underline{6125} \\ 2625 \\ \underline{2625} \end{array}$$

73. *Ans.*

17. Of a consignment of guano $\frac{207}{400}$ consisted of carbonate of lime and phosphates of lime and magnesia, and the phosphates made up $\frac{19}{40}$ of the guano. How many parts in a hundred of the guano were carbonate of lime?

$$\begin{array}{r} 4\cancel{0}\cancel{0}\underline{)207.00\cancel{0}\cancel{0}} \\ 0.5175 \end{array}$$

$$\begin{array}{r} 4\cancel{0}\underline{)19.00\cancel{0}} \\ 0.475 \end{array}$$

$$\frac{207}{400} = 0.5175, \ \frac{19}{40} = 0.475.$$

$$\begin{array}{l} 0.5175 \\ \underline{0.475} \\ 0.0425 = \text{carbonate.} \end{array}$$

Hence there were 4.25 parts of carbonate in a hundred.

18. Of the water of the Dead Sea $\frac{49}{1250}$ is muriate of lime, $\frac{41}{400}$ muriate of magnesia, $\frac{259}{2500}$ muriate of soda, $\frac{1}{2000}$ sulphate of lime. What part of the whole do these ingredients constitute?

$$\begin{array}{r} 0.03092 \\ 125\cancel{0}\overline{)49.0\cancel{0}} \\ \underline{375} \\ 1150 \\ \underline{1125} \\ 250 \\ \underline{250} \end{array}$$

$$\begin{array}{r} 4\cancel{0}\cancel{0}\underline{)41.\cancel{0}\cancel{0}} \\ 0.1025 \end{array}$$

$$\begin{array}{r} 0.1036 \\ 25\cancel{0}\cancel{0}\overline{)259.\cancel{0}\cancel{0}} \\ \underline{25} \\ 90 \\ \underline{75} \\ 150 \\ \underline{150} \end{array}$$

$$\begin{array}{r} 2\cancel{0}\cancel{0}\cancel{0}\underline{)1.0\cancel{0}\cancel{0}\cancel{0}} \\ 0.0005 \end{array}$$

$$\begin{array}{r} \frac{49}{1250} = 0.0392 \\ \frac{41}{400} = 0.1025 \\ \frac{259}{2500} = 0.1036 \\ \frac{1}{2000} = \underline{0.0005} \\ 0.2458 \end{array}$$

0.2458 *Ans.*

Ex. 96. (*Oral.*) Page 142.

1. From a piece of cloth $\frac{1}{3}$ of it and $\frac{1}{2}$ of it have been cut. What fraction of the cloth is left?

$\frac{1}{3} + \frac{1}{2} = \frac{5}{6}$; $1 - \frac{5}{6} = \frac{1}{6}$. *Ans.*

2. To make a yard of cloth, what fraction of a yard must be added to the sum of $\frac{1}{4}$ and $\frac{1}{3}$ of a yard?

$\frac{1}{4} + \frac{1}{3} = \frac{7}{12}$; $1 - \frac{7}{12} = \frac{5}{12}$. *Ans.*

3. A boy gave to his sister $\frac{1}{2}$ of an apple, to his brother $\frac{1}{2}$ as much as to his sister, and kept the rest himself. What part of the apple did he keep?

$$\tfrac{1}{2} \text{ of } \tfrac{1}{2} = \tfrac{1}{4};\ \tfrac{1}{4} + \tfrac{1}{2} = \tfrac{3}{4};\ 1 - \tfrac{3}{4} = \tfrac{1}{4}.\ \textit{Ans.}$$

4. A grocer sold $\frac{3}{4}$ of a dozen eggs, and carried home the rest of the dozen. How many did he carry home?

$$1 - \tfrac{3}{4} = \tfrac{1}{4};\ \tfrac{1}{4} \text{ of a dozen} = 3.\ \textit{Ans.}$$

5. What is meant by $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ of a unit?

One of the equal parts when a unit is divided into 2, 3, or 4 equal parts respectively.

6. How is $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ of a unit found?

By dividing the unit into 2, 3, or 4 equal parts respectively, and taking one of them.

7. How is $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ of a number found?

By dividing the number by 2, 3, or 4 respectively.

8. At $\frac{2}{3}$ of a dollar per yard, what is the cost of 6 yards of cloth?

$$6 \times \frac{\$2}{3} = \$4.\ \textit{Ans.}$$

9. At $7 per ton, what is the cost of $\frac{1}{3}$ of a ton of coal?

$$\tfrac{1}{3} \text{ of } \$7 = \$2\tfrac{1}{3}.\ \textit{Ans.}$$

10. Three packages of sugar weigh respectively $2\frac{1}{4}$, $3\frac{1}{2}$, $4\frac{1}{4}$ pounds. What is the weight of the whole?

$$2\tfrac{1}{4} + 3\tfrac{1}{2} + 4\tfrac{1}{4} = 9\tfrac{4}{4} = 10 \text{ pounds.}\ \textit{Ans.}$$

11. When poultry is worth 20 cents per pound, what must be paid for a turkey weighing $8\frac{1}{2}$ pounds, and a chicken weighing $3\frac{1}{4}$ pounds?

$$8\tfrac{1}{2} + 3\tfrac{1}{4} = 11\tfrac{3}{4} \text{ lbs.};\ 11\tfrac{3}{4} \times \$0.20 = \$2.35.\ \textit{Ans.}$$

12. From a jar of butter containing $15\frac{1}{2}$ pounds there have been sold $7\frac{3}{4}$ pounds. How many pounds remain in the jar?

$$15\tfrac{1}{2} - 7\tfrac{3}{4} = 7\tfrac{3}{4}.\ \textit{Ans.}$$

13. Change to mixed numbers $\frac{17}{4}$, $\frac{25}{2}$, $\frac{19}{3}$, $\frac{13}{7}$, $\frac{21}{5}$, $\frac{24}{11}$.

$4\frac{1}{4}$, $12\frac{1}{2}$, $6\frac{1}{3}$, $1\frac{6}{7}$, $4\frac{1}{5}$, $2\frac{2}{11}$. *Ans.*

14. Express in lowest terms $\frac{12}{16}$, $\frac{8}{12}$, $\frac{16}{20}$, $\frac{56}{63}$, $\frac{36}{42}$, $\frac{84}{108}$.

$\frac{3}{4}$, $\frac{2}{3}$, $\frac{4}{5}$, $\frac{8}{9}$, $\frac{6}{7}$, $\frac{7}{9}$. *Ans.*

15. Change to improper fractions $5\frac{1}{2}$, $6\frac{3}{5}$, $8\frac{5}{9}$, $9\frac{4}{7}$, $13\frac{1}{4}$.

$\frac{11}{2}$, $\frac{33}{5}$, $\frac{77}{9}$, $\frac{67}{7}$, $\frac{53}{4}$. *Ans.*

16. Reduce $\frac{3}{5}$ to 10ths; to 15ths; to 20ths; to 25ths.

$\frac{6}{10}$, $\frac{9}{15}$, $\frac{12}{20}$, $\frac{15}{25}$. *Ans.*

17. A lady gave $\frac{1}{2}$ a dollar to her daughter, and $\frac{1}{5}$ of a dollar to her son. What fraction of a dollar did the daughter receive more than the son?

$\frac{1}{2} - \frac{1}{5} = \frac{3}{10}$. *Ans.*

18. At $\frac{4}{5}$ of a dollar per bushel, how many bushels of apples can be bought for $3?

$3 \div \frac{4}{5} = 3 \times \frac{5}{4} = \frac{15}{4} = 3\frac{3}{4}$. *Ans.*

19. Four pecks make a bushel. If $2\frac{3}{8}$ pecks be sold from a bushel of cranberries, how many pecks remain?

$4 - 2\frac{3}{8} = 1\frac{5}{8}$. *Ans.*

20. A gentleman bought 2 pairs of gloves at $\$1\frac{1}{2}$ a pair, and 3 pairs of slippers at $\$1\frac{3}{4}$ per pair. He gave a ten-dollar bill in payment. What change should he receive?

$2 \times \$1\frac{1}{2} = \$3$; $3 \times \$1\frac{3}{4} = \$5\frac{1}{4}$;
$\$3 + \$5\frac{1}{4} = \$8\frac{1}{4}$; $\$10 - \$8\frac{1}{4} = \$1\frac{3}{4}$. *Ans.*

21. What part of 2 is 1? of 7 is 3? of 9 is 2? of 12 is 4?

$\frac{1}{2}$, $\frac{3}{7}$, $\frac{2}{9}$, $\frac{1}{3}$. *Ans.*

22. A farmer planted 3 bushels of potatoes, and harvested 50 bushels. What fraction of the crop was the seed?

$\frac{3}{50}$. *Ans.*

23. From a piece of cloth containing 81 yards there were sold 45 yards. What part of the piece was sold?

$\frac{45}{81} = \frac{5}{9}$. *Ans.*

24. What part of $\frac{4}{5}$ is $\frac{2}{3}$? of $\frac{1}{2}$ is $\frac{1}{3}$? of $\frac{1}{2}$ is $\frac{1}{5}$?

$\frac{4}{5} = \frac{12}{15}$; $\frac{2}{3} = \frac{10}{15}$. Hence $\frac{10}{12}$, or $\frac{5}{6}$. *Ans.*
$\frac{1}{2} = \frac{3}{6}$; $\frac{1}{3} = \frac{2}{6}$. Hence $\frac{2}{3}$. *Ans.*
$\frac{1}{2} = \frac{5}{10}$; $\frac{1}{5} = \frac{2}{10}$. Hence $\frac{2}{5}$. *Ans.*

25. What part of 8 is $\frac{1}{2}$? of 7 is $\frac{2}{3}$?

$8 = \frac{16}{2}$. Hence $\frac{1}{16}$. *Ans.* $7 = \frac{21}{3}$. Hence $\frac{2}{21}$. *Ans.*

26. In a year there are 365 days. What part of a year are 30 days? 50 days? 75 days? 105 days?

$\frac{30}{365} = \frac{6}{73}$; $\frac{50}{365} = \frac{10}{73}$; $\frac{75}{365} = \frac{15}{73}$; $\frac{105}{365} = \frac{21}{73}$. *Ans.*

27. Three-fourths of a cord of oak wood costs $\$6$. What is the cost of $\frac{1}{4}$ of a cord? of a cord?

$\frac{1}{3}$ of $\$6 = \$2$. *Ans.* $4 \times \$2 = \$8$. *Ans.*

28. Seven-eighths of a yard of cloth cost 42 cents. Find the cost of $\frac{1}{8}$ of a yard; of 1 yard; of $2\frac{1}{6}$ yards.

$\frac{1}{7}$ of 42 cents = 6 cents. *Ans.*
8×6 cents = 48 cents. *Ans.*
$2\frac{1}{6} \times 48$ cents = $\$1.04$. *Ans.*

29. Four-fifths of a load of wood is sold for $\$8$. Required the cost of $\frac{1}{5}$ of the load; of the whole load; of $4\frac{5}{8}$ such loads.

$\frac{1}{4}$ of $\$8 = \$2$. *Ans.* $5 \times \$2 = \$10$. *Ans.*

$$4\frac{5}{8} \times \$10 = \frac{37}{\underset{4}{\cancel{8}}} \times \$\overset{5}{\cancel{10}} = \frac{\$185}{4} = \$46\frac{1}{4}.\ \textit{Ans.}$$

30. What is the price of a bushel of turnips, when $\frac{3}{4}$ of a bushel are sold for 30 cents?

$\frac{1}{4}$ of a bushel costs $\frac{1}{3}$ of 30 cents = 10 cents. Therefore a bushel costs 4×10 cents = 40 cents. *Ans.*

31. A farmer divided among his four sons $\frac{2}{3}$ of his farm. What part of the farm did each son receive?

$$\frac{1}{\underset{2}{\cancel{4}}} \text{ of } \frac{\cancel{2}}{3} = \frac{1}{6}.\ \textit{Ans.}$$

32. At the rate of $10 per week, what is the cost of board per day?

$$\frac{1}{7} \text{ of } \$10 = \frac{\$10}{7} = \$1\tfrac{3}{7}. \textit{ Ans.}$$

33. How many bushels of carrots, at $⅔ per bushel, can be bought for $3⅓?

$$3\tfrac{1}{3} \div \tfrac{2}{3} = \frac{\cancel{3}}{\cancel{2}} \times \frac{\overset{5}{\cancel{10}}}{\cancel{3}} = 5. \textit{ Ans.}$$

34. How many cows are ⅘ of 20 cows? 16 sheep are ⅔ of how many sheep?

$$\frac{4}{\cancel{5}} \text{ of } \overset{4}{\cancel{20}} = 16. \textit{ Ans.} \qquad 16 \div \frac{2}{3} = \overset{8}{\cancel{16}} \times \frac{3}{\cancel{2}} = 24. \textit{ Ans.}$$

35. Five-sixths of 12 hens are 5/9 of how many hens?

$$\frac{5}{\cancel{6}} \text{ of } \overset{2}{\cancel{12}} = 10. \quad 10 \div \frac{5}{9} = \overset{2}{\cancel{10}} \times \frac{9}{\cancel{5}} = 18. \textit{ Ans.}$$

36. Three-fourths of a cord of wood, at $7 per cord, will pay for what part of a ton of coal, at $9 per ton?

$$\frac{3}{4} \times \$7 = \frac{\$21}{4}; \ \$9 = \frac{\$36}{4}.$$

$$\frac{\$21}{4} \text{ is } \frac{21}{36} \text{ of } \$9. \quad \frac{21}{36} = \frac{7}{12}. \textit{ Ans.}$$

37. The captain of a vessel owns ½ of it, the first mate ⅜, and captain's wife ½ of the remainder. What part of the vessel she own?

$$\tfrac{1}{2} + \tfrac{3}{8} = \tfrac{7}{8}; \ 1 - \tfrac{7}{8} = \tfrac{1}{8}. \quad \tfrac{1}{2} \text{ of } \tfrac{1}{8} = \tfrac{1}{16}. \textit{ Ans.}$$

38. John Rogers sold to Henry Cook ½ of his woodland, and bought back ⅓ of what he had sold. What part of the land did have then?

$$\tfrac{1}{3} \text{ of } \tfrac{1}{2} = \tfrac{1}{6}.$$

$$\left.\begin{array}{ll} \text{Hence} & \text{John Rogers had } \tfrac{1}{2} + \tfrac{1}{6} = \tfrac{2}{3}, \\ \text{and} & \text{Henry Cook had } \tfrac{1}{2} - \tfrac{1}{6} = \tfrac{1}{3}. \end{array}\right\} \textit{Ans.}$$

39. From a bin of potatoes containing 30 bushels, $5\frac{1}{2}$ bushels, $2\frac{1}{2}$ bushels, $4\frac{3}{4}$ bushels, were sold. How many bushels were left in the bin?

$5\frac{1}{2} + 2\frac{1}{2} + 4\frac{3}{4} = 12\frac{3}{4}$. $30 - 12\frac{3}{4} = 17\frac{1}{4}$. *Ans.*

40. A bushel of wheat weighs 60 pounds. If the miller takes 3 pounds from each bushel for toll, what part of a bushel does he take?

$\frac{3}{60} = \frac{1}{20}$. *Ans.*

41. At 20 cents per yard, how many yards of ribbon can be bought for $2.20?

$\$2.20 \div 20 = 11$. *Ans.*

42. Four-fifths of $20 is $\frac{2}{3}$ of how much money?

$\frac{4}{\cancel{5}}$ of $\$\overset{4}{\cancel{20}} = \$16$. $\$16 \div \frac{2}{3} = \frac{3}{2} \times \$16 = \$24$. *Ans.*

43. Two-thirds of a yard of silk can be bought for $\$\frac{3}{4}$. What is the price per yard? How many yards can be bought for $\$3\frac{3}{8}$?

$\frac{\$3}{4} \div \frac{2}{3} = \frac{3}{2} \times \frac{\$3}{4} = \frac{\$9}{8} = 1\frac{1}{8}$. *Ans.*

$\$3\frac{3}{8} \div 1\frac{1}{8} = 3$. *Ans.*

44. If 5 bushels of oats cost $2, what will be the cost of 9 bushels at the same rate?

1 bushel costs $\frac{1}{5}$ of $\$2 = \frac{\$2}{5} = \$0.40$. *Ans.*

9 bushels costs $9 \times \$0.40 = \$3.60$. *Ans.*

45. If $\$1\frac{1}{2}$ are paid for $\frac{3}{4}$ of a yard of velvet, what will be the cost of $\frac{5}{8}$ of a yard?

1 yard costs $\$1\frac{1}{2} \div \frac{3}{4} = \frac{\overset{2}{\cancel{4}}}{\cancel{3}} \times \frac{\$\cancel{3}}{\cancel{2}} = \$2$.

$\frac{5}{8}$ of a yard costs $\frac{5}{\underset{4}{\cancel{8}}}$ of $\$\cancel{2} = \frac{\$5}{4} = \$1\frac{1}{4}$. *Ans.*

46. If $\frac{2}{3}$ of the distance between two towns is $6\frac{4}{5}$ miles, what is the whole distance?

$6\frac{4}{5} \div \frac{2}{3} = \frac{3}{\cancel{2}} \times \frac{\overset{17}{\cancel{34}}}{5} = \frac{51}{5} = 10\frac{1}{5}$ miles. *Ans.*

47. If $2\frac{3}{4}$ bushels of apples make a barrel, how many barrels will 11 bushels make?

$$11 \div 2\tfrac{3}{4} = \cancel{11} \times \frac{4}{\cancel{11}} = 4. \textit{ Ans.}$$

48. A carpet dealer sold $\frac{2}{3}$ of $\frac{1}{2}$ of a roll of carpet. What part of the roll was left?

$$\frac{\cancel{2}}{3} \times \frac{1}{\cancel{2}} = \frac{1}{3};\ 1 - \tfrac{1}{3} = \tfrac{2}{3}. \textit{ Ans.}$$

49. How many pigs can be bought for \$20, at \$$2\frac{1}{2}$ each?

$$20 \div 2\tfrac{1}{2} = \overset{4}{\cancel{20}} \times \frac{2}{\cancel{5}} = 8. \textit{ Ans.}$$

50. Four quarts make a gallon. When $2\frac{1}{2}$ quarts have been taken from a gallon of vinegar, what part of the gallon has been taken?

$2\frac{1}{2} = \frac{5}{2}$; $4 = \frac{8}{2}$.

Therefore the part taken is $\frac{5}{8}$. *Ans.*

51. A drover puts $\frac{1}{2}$ of his cattle in a field, $\frac{2}{5}$ of them in another field, and 10 in a barn. How many cattle has he?

$\frac{1}{2} + \frac{2}{5} = \frac{9}{10}$; $1 - \frac{9}{10} = \frac{1}{10}$.

$10 \div \frac{1}{10} = 10 \times 10 = 100$. *Ans.*

52. A merchant sold $\frac{1}{3}$ of a chest of tea, then $\frac{1}{2}$ of it, and took the rest home. If he took home 12 pounds, how many pounds were there in the chest at first?

$\frac{1}{3} + \frac{1}{2} = \frac{5}{6}$; $1 - \frac{5}{6} = \frac{1}{6}$.

$12 \div \frac{1}{6} = 12 \times 6 = 72$. *Ans.*

53. A cistern has two pipes. By one pipe, 3 gallons of water run into the cistern in a minute, and by the other, 5 gallons run out in a minute. If the cistern contains 42 gallons, and both pipes are open, in how many minutes will it be emptied?

In each minute 2 gallons more run out than run in. Hence it will take $42 \div 2 = 21$ minutes to empty the cistern.

54. A man can perform a certain piece of work in 4 hours, and a boy can do the same work in 6 hours. What part of the work can the man do in 1 hour? What part can the boy do? What part can both together do? How many hours will it take both together to do the work?

$\frac{1}{4}$. *Ans.* $\frac{1}{6}$. *Ans.* $\frac{1}{4} + \frac{1}{6} = \frac{5}{12}$. *Ans.* $\frac{12}{5} = 2\frac{2}{5}$. *Ans.*

55. C can plant an acre of corn in 6 hours, C and D together in 4 hours. What part of an acre can C and D together plant in 1 hour? What part can C plant in 1 hour? What part then can D plant in 1 hour? How many hours will it take D to plant the acre of corn?

$\frac{1}{4}$. *Ans.* $\frac{1}{6}$. *Ans.* $\frac{1}{4} - \frac{1}{6} = \frac{1}{12}$. *Ans.* 12. *Ans.*

56. A fox is 90 rods in advance of a greyhound. The fox runs 60 rods in a minute; the greyhound, 65. In how many minutes will the fox be overtaken?

The greyhound gains 5 rods a minute. Hence it will take $90 \div 5 = 18$ minutes.

57. By selling cigars at $7 a hundred $\frac{3}{11}$ of their cost is gained. Find the price per hundred at which they must be sold, in order to gain $\frac{3}{5}$ of their cost.

$7 is the cost $\frac{11}{11}$ + the gain $\frac{3}{11} = \frac{14}{11}$.

Therefore the cost is $\frac{11}{\underset{2}{\cancel{14}}}$ of $\$\cancel{7} = \frac{\$11}{2}$.

$$\frac{\overset{4}{\cancel{8}}}{5} \times \frac{\$11}{\cancel{2}} = \frac{\$44}{5} = \$8\tfrac{4}{5}. \textit{ Ans.}$$

58. By selling a farm for $2400, the owner lost $\frac{1}{5}$ of what it cost him. How much did he pay for the farm?

$2400 is $\frac{4}{5}$ of the cost.

Therefore the cost is $\frac{5}{\cancel{4}}$ of $\$\overset{600}{\cancel{2400}} = \$3000$. *Ans.*

59. How many flowers can be planted along the borders of a flower-bed 12 feet long and 10 feet wide, if the flowers are $\frac{1}{2}$ of a foot apart?

$12 + 10 + 12 + 10 = 44$ feet.
$44 \div \frac{1}{2} = 44 \times 2 = 88$. *Ans.*

Ex. 97. Page 147.

1. Reduce to simple fractions, $8\frac{2}{3}$ of $\frac{2}{3}$ of $\frac{7}{8}$, $\frac{9\frac{1}{6}}{\frac{1}{2}\text{ of }7}$, $\frac{\frac{2}{3}\text{ of }\frac{3}{4}}{\frac{1}{2}\text{ of }\frac{2}{3}}$.

$$8\tfrac{2}{3}\times\tfrac{2}{3}\times\tfrac{7}{8}=\frac{\overset{13}{\cancel{26}}}{3}\times\frac{\cancel{2}}{3}\times\frac{7}{\underset{\underset{2}{\cancel{4}}}{\cancel{8}}}=\frac{91}{18}=5\tfrac{1}{18}.\ \textit{Ans.}$$

$$\frac{9\frac{1}{6}}{\frac{1}{2}\text{ of }7}=\frac{55}{\underset{3}{\cancel{6}}}\times\cancel{2}\times\frac{1}{7}=\frac{55}{21}=2\tfrac{13}{21}.\ \textit{Ans.}$$

$$\frac{\frac{2}{3}\text{ of }\frac{3}{4}}{\frac{1}{2}\text{ of }\frac{2}{3}}=\frac{\cancel{2}}{\cancel{3}}\times\frac{3}{\underset{2}{\cancel{4}}}\times\cancel{2}\times\frac{\cancel{3}}{\cancel{2}}=\frac{3}{2}=1\tfrac{1}{2}.\ \textit{Ans.}$$

2. Find the values of $169-14\frac{4}{7}$; $1\frac{9}{11}-\frac{1}{3}$ of 4; $76\frac{1}{4}-\frac{2}{3}$ of 19.

$169-14\frac{4}{7}=154\frac{3}{7}$. *Ans.*

$\frac{1}{3}$ of $4=\frac{4}{3}=\frac{44}{33}$; $1\frac{9}{11}=\frac{20}{11}=\frac{60}{33}$; $\frac{60}{33}-\frac{44}{33}=\frac{16}{33}$. *Ans.*

$\frac{2}{3}$ of $19=\frac{38}{3}=12\frac{2}{3}=12\frac{8}{12}$; $76\frac{1}{4}=76\frac{3}{12}$; $76\frac{3}{12}-12\frac{8}{12}=63\frac{7}{12}$. *Ans.*

3. Six pieces of cloth measure respectively $23\frac{1}{2}$ yards, $19\frac{2}{3}$ yards, $21\frac{5}{6}$ yards, $24\frac{7}{8}$ yards, $35\frac{11}{12}$ yards, $18\frac{3}{4}$ yards. After $39\frac{5}{24}$ yards have been sold from their sum, how much remains?

L. C. D. of the fractions = 24.

$$\text{Numerators}\ \ldots\ \left\{\begin{array}{r}12\\16\\20\\21\\22\\18\end{array}\right.$$

$$\begin{array}{lll}\text{Sum of numerators} & =109 & \\ \text{Sum of fractions} & =\frac{109}{24} & =\ \ 4\frac{13}{24}\\ \text{Sum of integers} & =23+19+21+24+35+18 & =140\\ \hline & & 144\frac{13}{24}.\end{array}$$

$144\frac{13}{24}-39\frac{5}{24}=105\frac{8}{24}=105\frac{1}{3}$. yards. *Ans.*

4. The remainder being 4, the quotient 51, and the divisor 25, it is required to find the dividend.

$$\begin{array}{r} 51 \\ \underline{25} \\ 255 \\ \underline{102} \\ 1275 \\ \underline{4} \\ 1279 \end{array} \; \textit{Ans.}$$

5. Find the value of ⅜ of a chest of tea weighing 57½ pounds, at $1½ per pound.

$$\frac{3}{8} \times 57\tfrac{1}{2} = \frac{3}{8} \times \frac{115}{2} = \frac{345}{16},$$

$$\frac{345}{16} \times \frac{\$3}{2} = \frac{1035}{32} = \$32\tfrac{11}{32} = \$32.34. \; \textit{Ans.}$$

6. If a man work 8½ hours in a day he can finish a piece of work in 12½ days. How many hours per day must he work to complete it in 10⅝ days?

$8\tfrac{1}{2} \times 12\tfrac{1}{2}$ = whole number of hours.

$8\tfrac{1}{2} \times 12\tfrac{1}{2} \div 10\tfrac{5}{8}$ = number of days of $10\tfrac{5}{8}$ hours.

$$8\tfrac{1}{2} \times 12\tfrac{1}{2} \div 10\tfrac{5}{8} = \frac{\cancel{17}}{\cancel{2}} \times \frac{\overset{5}{\cancel{25}}}{\cancel{2}} \times \frac{\overset{\overset{2}{\cancel{4}}}{\cancel{8}}}{\underset{\cancel{5}}{\cancel{85}}} = 10. \; \textit{Ans.}$$

7. A confectioner sells ⅔ of ½ of a bushel of walnuts. What part of the bushel remains, and what will it bring at 15 cents per quart?

$$\frac{\cancel{2}}{3} \times \frac{1}{\cancel{2}} = \frac{1}{3}; \; 1 - \tfrac{1}{3} = \tfrac{2}{3}. \; \textit{Ans.}$$

1 bushel contains 32 quarts.

$$\frac{2}{\cancel{3}} \times 32 \times \$\overset{0.05}{\cancel{0.15}} = \$3.20. \; \textit{Ans.}$$

8. What is the value of a basket of 588 eggs, worth 25 cents per dozen?

$$12\overline{)588} \qquad\qquad \begin{array}{r} \$0.25 \\ \underline{49} \\ 225 \\ \underline{100} \\ \$12.25 \end{array} \; \textit{Ans.}$$

$$49$$

9. A man starts on a journey 5 hours before the mail coach. How many miles will the coach be ahead of the man after it has run for 12 hours, supposing that he travels at the rate of 3 miles an hour, and the coach 10 miles an hour?

$$\begin{array}{r} 12 \\ \underline{10} \\ 120 \end{array} \qquad \begin{array}{r} 17 \\ \underline{3} \\ 51 \end{array} \qquad \begin{array}{r} 120 \\ \underline{-51} \\ 69 \end{array} \text{ Ans.}$$

10. If $\frac{5}{7}$ of $\frac{2}{3}$ of a piece of land cost $420, what is the value of the whole?

$\frac{5}{7} \times \frac{2}{3} = \frac{10}{21}$. $\frac{10}{21} = \$420$. $\frac{1}{21} = \$42$; $\frac{21}{21} = \$882$. *Ans.*

11. A farmer sold at market 15 sheep at 2\frac{5}{8}$ each, and bought 7 yards of cloth at 1\frac{4}{5}$ per yard. How much money did he take home?

$$15 \times \$2\tfrac{5}{8} = 15 \times \frac{\$21}{8} = \frac{\$315}{8} = \$39\tfrac{3}{8} = \$39.38.$$

$$7 \times \$1\tfrac{4}{5} = 7 \times \frac{\$9}{5} = \frac{\$63}{5} = \$12\tfrac{3}{5} = \$12.60.$$

$$\begin{array}{r} \$39.38 \\ \underline{12.60} \\ \$26.78 \end{array} \text{ Ans.}$$

12. A man walked a distance of 60 miles; for the first 5 hours, at the rate of 3 miles an hour, and during the remainder of the journey he walked at the rate of 4 miles an hour. In how many hours did he complete the journey?

$5 \times 3 = 15$; $60 - 15 = 45$.
$45 \div 4 = 11\frac{1}{4}$; $11\frac{1}{4} + 5 = 16\frac{1}{4}$. *Ans.*

13. The circumference of a fore wheel of a wagon is 6$\frac{2}{3}$ feet; that of the hind wheel 8$\frac{4}{5}$ feet. In a distance of 20 miles, of 5280 feet each, how many more turns will be made by the former than by the latter?

$$\begin{array}{r} 5280 \\ \underline{20} \\ 105600 \end{array}$$

$$105600 \div 6\tfrac{2}{3} = \overset{5280}{\cancel{105600}} \times \frac{3}{\cancel{20}} = 15840$$

$$105600 \div 8\tfrac{4}{5} = \overset{2400}{\cancel{105600}} \times \frac{5}{\cancel{44}} = \underline{12000}$$

$$3840 \text{ Ans.}$$

14. A young man received $1200 from his father. He spent $\frac{1}{9}$ of the money for clothes, $\frac{1}{2}$ of it in travelling, and invested the remainder in a mortgage. What fraction of the whole was the sum invested?

$$\tfrac{1}{9} + \tfrac{1}{2} = \tfrac{11}{18};\ 1 - \tfrac{11}{18} = \tfrac{7}{18}.\ \textit{Ans.}$$

15. A baker paid $32 for $\frac{4}{7}$ of a hogshead of molasses. What was the value of $\frac{1}{3}$ of the remainder?

$$1 - \tfrac{4}{7} = \tfrac{3}{7};\ \frac{1}{\cancel{3}} \times \frac{\cancel{3}}{7} = \frac{1}{7}. \qquad \frac{1}{7} \text{ costs } \frac{1}{\cancel{4}} \text{ of } \$\overset{8}{\cancel{32}} = \$8.\ \textit{Ans.}$$

16. A gentleman paid $125 for keeping 2 horses 12 weeks. What would it cost, at the same rate, to keep one horse $\frac{2}{3}$ of a week?

$$\frac{\$125}{24} = \text{cost of keeping 1 horse 1 week.}$$

$$\frac{\cancel{2}}{3} \times \frac{\$125}{\underset{12}{\cancel{24}}} = \frac{\$125}{36} = \$3\tfrac{17}{36} = \$3.47.\ \textit{Ans.}$$

17. If $\frac{5}{9}$ of a yard of ribbon cost $\$\frac{7}{8}$, what will be the value of $5\frac{2}{3}$ yards?

$$1 \text{ yard costs } \frac{\$7}{8} \div \frac{5}{9}.$$

$$5\tfrac{2}{3} \times \frac{\$7}{8} \div \frac{5}{9} = \frac{17}{\cancel{3}} \times \frac{\overset{3}{\cancel{9}}}{5} \times \frac{\$7}{8} = \frac{\$357}{40} = \$8\tfrac{37}{40} = \$8.93.\ \textit{Ans.}$$

18. Reduce $\frac{4}{5}$, $\frac{7}{8}$, $\frac{9}{18}$ to decimal fractions, and add the results.

$\frac{4}{5} = 0.8$; $\frac{7}{8} = 0.875$, $\frac{9}{18} = \frac{1}{2} = 0.5$.

$$\begin{array}{l} 0.8 \\ 0.875 \\ \underline{0.5} \\ 2.175\ \textit{Ans.} \end{array}$$

19. The contents of a chest of tea weighing 87.5 pounds are made up into 1 pound, $\frac{1}{2}$ pound, $\frac{1}{4}$ pound packages, an equal number of each. How many packages of each kind?

$$1 + \tfrac{1}{2} + \tfrac{1}{4} = \tfrac{7}{4}.$$

$$87.5 \div \tfrac{7}{4} = \frac{\overset{25}{\cancel{175}}}{\cancel{2}} \times \frac{\overset{2}{\cancel{4}}}{\cancel{7}} = 50.\ \textit{Ans.}$$

20. For five successive days a farmer puts into his bin $37\frac{7}{8}$ bushels of potatoes, and on each of these days he sells $19\frac{2}{3}$ bushels. How many bushels have been put into the bin? How many more are in the bin at the end than at the beginning of the five days?

$$\begin{array}{r} 37\frac{7}{8} \\ 5 \\ \hline 189\frac{3}{8} \end{array}\ \textit{Ans.} \qquad\qquad \begin{array}{r} 19\frac{2}{3} \\ 5 \\ \hline 98\frac{1}{3} \end{array}$$

$189\frac{3}{8} - 98\frac{1}{3} = 91\frac{1}{24}$. *Ans.*

21. A man's weekly income is $\$18\frac{1}{2}$, and his weekly expenses are $\$23\frac{2}{3}$. If he have $\$75\frac{1}{4}$ in reserve, how many weeks can he live without incurring debt?

$23\frac{2}{3} - 18\frac{1}{2} = 5\frac{1}{6}$.

$$75\frac{1}{4} \div 5\frac{1}{6} = \frac{301}{\underset{2}{\cancel{4}}} \times \frac{\overset{3}{\cancel{6}}}{31} = \frac{903}{62} = 14\frac{35}{62}.\ \textit{Ans.}$$

22. By a leak $87\frac{5}{9}$ barrels of water enter the hold of a boat in 1 hour; the pumps will discharge $58\frac{2}{3}$ barrels in an hour. If she can carry only 875 barrels, in how many hours will she sink?

$87\frac{5}{9} - 58\frac{2}{3} = 28\frac{8}{9}$.

$$875 + 28\frac{8}{9} = \overset{175}{\cancel{875}} \times \frac{9}{\underset{52}{\cancel{260}}} = \frac{1575}{52} = 30\frac{15}{52}.\ \textit{Ans.}$$

23. A can mow a field in 10 days, B in 8 days, and C in 5 days. When working together, how many days will they need?

In 1 day A can mow $\frac{1}{10}$; B, $\frac{1}{8}$; C, $\frac{1}{5}$ of the field.

Therefore all three can mow $\frac{1}{10} + \frac{1}{8} + \frac{1}{5} = \frac{17}{40}$ of the field.

Hence it will take $1 \div \frac{17}{40} = \frac{40}{17} = 2\frac{6}{17}$ days. *Ans.*

24. A carpenter alone can build a shop in 15 days, and with the help of his son he can build it in 10 days. In how many days will the son alone build the shop?

The carpenter can build $\frac{1}{15}$ in 1 day.

The carpenter and the son can build $\frac{1}{10}$ in 1 day.

Therefore the son can build $\frac{1}{10} - \frac{1}{15} = \frac{1}{30}$ in 1 day, or the whole in 30 days. *Ans.*

25. Wales Edwards and George Peters hire a pasture for \$14. Edwards put in 8 horses; Peters puts in 50 sheep. If 21 sheep will eat as much as 2 horses, what must each pay?

8 horses eat as much as $4 \times 21 = 84$ sheep. $50 + 84 = 134$.

Therefore Edwards must pay $\frac{\overset{42}{\cancel{84}}}{\underset{67}{\cancel{134}}}$ of $\$14 = \frac{\$588}{67} = \$8\frac{52}{67} = \$8.78$, *Ans.*

and Peters must pay $\frac{\overset{25}{\cancel{50}}}{\underset{67}{\cancel{134}}}$ of $\$14 = \frac{\$350}{67} = \$5\frac{15}{67} = \$5.22$. *Ans.*

26. A flour dealer bought 125 barrels of flour at \$6⅔. He sold 97 barrels at \$7¾, and the remainder, being injured, brought only \$5⅘. What did he gain?

$$125 \times \$6\tfrac{2}{3} = 125 \times \frac{\$20}{3} = \frac{\$2500}{3} = \$833\tfrac{1}{3} = \$833.33.$$

$$97 \times \$7\tfrac{3}{4} = 97 \times \frac{\$31}{4} = \frac{\$3007}{4} = \$751\tfrac{3}{4} = \$751.75.$$

$$125 - 97 = 28.$$

$$28 \times \$5\tfrac{4}{5} = 28 \times \frac{\$29}{5} = \frac{\$812}{5} = \$162\tfrac{2}{5} = \$162.40.$$

$$\begin{array}{r} \$751.75 \\ +\ 162.40 \\ \hline \$914.15 \\ -\ 833.33 \\ \hline \$80.82 \end{array}\ \textit{Ans.}$$

27. A lady bought ⅔ of ⅘ of a yard of ribbon for \$1³⁄₇. What was the cost per yard?

$$\tfrac{2}{3} \times \tfrac{4}{5} = \tfrac{8}{15}.$$

$$\$1\tfrac{3}{7} \div \tfrac{8}{15} = \frac{15}{\underset{4}{\cancel{8}}} \times \frac{\overset{5}{\$\cancel{10}}}{7} = \frac{\$75}{28} = \$2\tfrac{19}{28} = \$2.68.\ \textit{Ans.}$$

28. From two fields 482 bushels of corn are gathered. The first field yields ½ as much as the second. How many bushels does each field yield?

The first yields ⅓ of 482 = 160⅔ bushels. *Ans.*

The second yields ⅔ of 482 = 321⅓ bushels. *Ans.*

29. A farmer brought to market 3 jars of butter, weighing 26 pounds, 37 pounds, 19 pounds. The empty jars weighed $3\frac{1}{3}$ pounds, $4\frac{1}{2}$ pounds, $5\frac{5}{6}$ pounds. The butter brought \$30. What was the price per pound?

$$\begin{array}{ll} 26 & 3\frac{1}{3} + 4\frac{1}{2} + 5\frac{5}{6} = 12\frac{2+3+5}{6} = 13\frac{2}{3}. \\ 37 & 82 - 13\frac{2}{3} = 68\frac{1}{3},\ \text{pounds of butter.} \\ \underline{19} & \\ 82 & \$30 \div 68\frac{1}{3} = \frac{3}{\underset{41}{\cancel{205}}} \times \$\overset{6}{\cancel{30}} = \frac{\$18}{41} = \$0.44.\ \textit{Ans.} \end{array}$$

30. From 120 acres of land $32\frac{1}{5}$ acres are sold to one man, and $\frac{1}{3}$ of the remainder to another. How many acres are unsold?

$120 - 32\frac{1}{5} = 87\frac{4}{5}.$ $\frac{1}{3} \times 87\frac{4}{5} = \frac{1}{3} \times \frac{439}{5} = \frac{439}{15} = 29\frac{4}{15}.$
$87\frac{4}{5} - 29\frac{4}{15} = 58\frac{8}{15}.$ *Ans.*

31. If the rent of 3 acres of land for $\frac{2}{3}$ of a year be \$9, what will be the rent of 45 acres for 1 year?

$$\text{Rent of 3 acres for 1 year} = \$9 \div \frac{2}{3} = \$9 \times \frac{3}{2} = \frac{\$27}{2}.$$

$$\text{Rent of 1 acre for 1 year} = \frac{\$27}{2} \div 3 = \frac{\$\overset{9}{\cancel{27}}}{2} \times \frac{1}{\cancel{3}} = \frac{\$9}{2}.$$

$$\text{Rent of 45 acres for 1 year} = \frac{\$9}{2} \times 45 = \frac{\$405}{2} = \$202.50.\ \textit{Ans.}$$

32. If $\frac{5}{9}$ of a ton of coal cost \$4, how many tons can be bought for $\$145\frac{3}{4}$?

If $\frac{5}{9}$ of a ton cost \$4, 1 ton will cost $\$4 \div \frac{5}{9} = \$4 \times \frac{9}{5} = \frac{\$36}{5}.$

Therefore for $\$145\frac{3}{4}$ he can buy

$$145\frac{3}{4} \div \frac{36}{5} = \frac{583}{4} \times \frac{5}{36} = \frac{2915}{144} = 20\frac{35}{144}.\ \textit{Ans.}$$

33. If 12 horses eat $65\frac{2}{3}$ bushels of oats in 3 months, how many bushels will 7 horses eat in 2 years?

$$\text{1 horse eats in 3 months, } \frac{65\frac{2}{3}}{12} = \frac{197}{36}.$$

$$\text{1 horse eats in 1 year } \frac{197}{\underset{9}{\cancel{36}}} \times \cancel{4} = \frac{197}{9}.$$

$$\text{7 horses eat in 2 years } \frac{197}{9} \times 7 \times 2 = \frac{2758}{9} = 306\frac{4}{9}.\ \textit{Ans.}$$

34. The agent for a line of steamers sells $\frac{1}{3}$ of a steamship to one company, $\frac{1}{4}$ of the remainder to a second, and $\frac{1}{2}$ of what is left to a third. What part of the whole ship has the third company?

If $\frac{1}{3}$ of the steamship is sold, $\frac{2}{3}$ remains.

If $\frac{1}{4}$ of the remainder is sold, $\frac{1}{\underset{2}{\cancel{4}}}$ of $\frac{\cancel{2}}{3} = \frac{1}{6}$ is sold, and there remains $\frac{2}{3} - \frac{1}{6} = \frac{1}{2}$.

If a third company has $\frac{1}{2}$ of what remains it has $\frac{1}{2}$ of $\frac{1}{2} = \frac{1}{4}$. *Ans.*

35. A farmer exchanged 13 loads of oats, of 18 bags each, every bag containing $2\frac{1}{2}$ bushels, for 150 sheep, at \$2.925. What was the price of the oats per bushel?

$$\begin{array}{r} 18 \\ \underline{2\frac{1}{2}} \\ 9 \\ \underline{36} \\ 45 \\ \underline{13} \\ 135 \\ \underline{45} \\ 585 \end{array} \qquad\qquad \begin{array}{r} \$2.925 \\ \underline{150} \\ 146250 \\ \underline{2925} \\ \$438.750 \end{array}$$

$$\begin{array}{r} \$0.75 \\ 585\overline{)\$438.75} \\ \underline{4095} \\ 2925 \\ \underline{\underline{2925}} \end{array}$$

\$0.75 *Ans.*

36. Two men 95.784 miles apart approached each other until they met. One travelled 7.476 miles more than the other. How many miles did each travel?

$$\begin{array}{rl} 95.784 & \\ \underline{-\,7.476} & \\ 2\overline{)88.308} & \\ 44.154 & = \text{miles one travelled.} \\ \underline{+\,7.476} & \\ 51.630 & = \text{miles the other travelled.} \end{array}$$

37. A teacher spent $\frac{3}{5}$ of his salary in board for himself and family, and $\frac{1}{10}$ of it in clothing for himself. The clothing of his wife and child cost $\frac{7}{8}$ as much as his own. At the end of the year \$187 remained. What was his salary?

$\frac{3}{5} + \frac{1}{10} + \frac{7}{8}$ of $\frac{1}{10} = \frac{63}{80}$. $\quad \frac{80}{80} - \frac{63}{80} = \frac{17}{80}$. $\quad \frac{17}{80} = \$187$.

$\frac{1}{80} = \$187 \div 17 = \$11$. $\quad \frac{80}{80} = 80 \times \$11 = \$880$. *Ans.*

38. A road to the top of a hill has a rise of $\frac{1}{6}$ of a foot in 100 feet. How many feet is the total elevation of the hill, if the length of the road is 2 miles?

$$5280 \times 2 = 10560.$$

$$\begin{array}{r|r} 10\cancel{0} & 1056\cancel{0}. \\ \hline 6 & 105.6 \\ \hline & 17.6 \end{array}\ \textit{Ans.}$$

39. A man bequeathes to his wife $\frac{1}{3}$ of his estate; to his daughter, $\frac{1}{5}$ of it; to his son, $\frac{1}{2}$ of the daughter's share; he divides the remainder equally between a hospital and a public library. What part is received by the hospital?

$$\tfrac{1}{3} + \tfrac{1}{5} + \frac{\tfrac{1}{5}}{2} = \tfrac{19}{30}. \quad \tfrac{30}{30} - \tfrac{19}{30} = \tfrac{11}{30}. \quad \tfrac{11}{30} \div 2 = \tfrac{11}{60}. \ \textit{Ans.}$$

40. If the above estate is worth $150,784, what is the amount received by the hospital?

$$\frac{11}{\underset{15}{\cancel{60}}} \text{ of } \frac{\overset{37696}{\$\cancel{150784}}}{1} = \frac{\$414656}{15} = \$27,643.73\ \textit{Ans.}$$

41. A can build a wall in 7 days, B in 6 days, and C in 5 days. A and B worked together for 2 days, when they were joined by C. How many days will they need to complete the remainder of the work?

A can do $\frac{1}{7}$ in 1 day.
B can do $\frac{1}{6}$ in 1 day.
C can do $\frac{1}{5}$ in 1 day.
A and B can do $(\frac{1}{7} + \frac{1}{6}) \times 2 = \frac{13}{21}$ in 2 days.
$\frac{21}{21} - \frac{13}{21} = \frac{8}{21}$ remaining to be done.
A, B, and C can do $\frac{1}{7} + \frac{1}{6} + \frac{1}{5} = \frac{107}{210}$ in 1 day.
To do $\frac{8}{21}$ it will take

$$\frac{8}{21} \div \frac{107}{210} = \frac{8}{\cancel{21}} \times \frac{\overset{10}{\cancel{210}}}{107} = \frac{80}{107}.\ \textit{Ans.}$$

42. Find the cost of 75,849 bricks, at $9.75 per M.

```
   75.849
     9.75
   379245
  530943
 682641
739.52775
```

$739.53. *Ans.*

43. A lumberman exchanged 50,495 feet of round timber, at $4½ per M, for pork, at $20¾ per barrel. How many barrels of pork did he receive?

```
   50.495
     4.50
  2524750
  201980
227.22750
```

10.96. *Ans.*

20¾ = 20.75.

```
        10.95
2075)22722.75
     2075
       19727
       18675
        10525
        10375
          150
```

44. For ⅞ of a bushel of apples $¾ are paid. What will 4 5/9 bushels be worth?

If ⅞ of a bushel is worth $\frac{\$3}{4}$. 1 bushel is worth

$$\frac{\$3}{4} \div \frac{7}{8} = \frac{\$3}{\cancel{4}} \times \frac{\overset{2}{\cancel{8}}}{7} = \frac{\$6}{7}.$$

4 5/9 bushels are worth

$$4\tfrac{5}{9} \times \frac{\$6}{7} = \frac{41}{\underset{3}{\cancel{9}}} \times \frac{\$\overset{2}{\cancel{6}}}{7} = \frac{\$82}{21} = \$3\tfrac{19}{21} = \$3.90.\ \textit{Ans.}$$

45. Henry Jones bought at a saw-mill 3485 ft. boards, at $7.50 per M; 9872 feet laths, at $0.25 per C; 6492 feet flooring, at $8¾ per M; 8975 feet cherry boards, at $15.05 per M. He paid $152.75 in cash, and the balance in flour, at $9.25 per barrel. Required the number of barrels of flour.

$$\begin{array}{r} 3.485 \\ 7.50 \\ \hline 174250 \\ 24395 \\ \hline 26.13750 \end{array} \qquad \begin{array}{r} 98.72 \\ 0.25 \\ \hline 49360 \\ 19744 \\ \hline 24.6800 \end{array}$$

$$\begin{array}{r} 6.492 \\ 8\frac{3}{4} \\ \hline 4869 \\ 51936 \\ \hline 56.805 \end{array} \qquad \begin{array}{r} 8.975 \\ 15.05 \\ \hline 44875 \\ 44875 \\ 8975 \\ \hline 135.07375 \end{array}$$

$$\begin{array}{r} \$26.1375 \\ 24.68 \\ 56.805 \\ 135.07375 \\ \hline \$242.69625 \\ 152.75 \\ \hline \$89.94625 \end{array} \qquad \begin{array}{r} 9.723 \\ 925)\overline{8994.625} \\ 8325 \\ \hline 6696 \\ 6475 \\ \hline 2212 \\ 1850 \\ \hline 3625 \\ 2775 \\ \hline 850 \end{array}$$

9.724. *Ans.*

46. A merchant mixed 7 pounds of black tea at 68 cents with 9 pounds of green tea at 75 cents. At what price per pound must he sell the mixture to gain \$3.69?

$$\begin{array}{r} \$0.68 \\ 7 \\ \hline \$4.76 \\ \\ \$0.75 \\ 9 \\ \hline \$6.75 \end{array} \qquad \begin{array}{r} \$4.76 \\ 6.75 \\ \hline \$11.51 \\ 3.69 \\ \hline \$15.20 \end{array} \qquad \begin{array}{r} \$0.95 \\ 16)\overline{\$15.20} \\ 144 \\ \hline 80 \\ 80 \\ \hline \end{array}$$

$7 + 9 = 16.$ \$0.95. *Ans.*

47. Nine men working 10 hours per day will harvest a piece of grain in 8 days. How many days will be needed for the same work by 6 men working 9 hours per day?

1 man working 1 hour a day would take $8 \times 9 \times 10$ days in harvesting.

6 men working 9 hours a day would take

$$\frac{\overset{4}{\cancel{8}} \times \cancel{9} \times 10}{\underset{3}{\cancel{6}} \times \cancel{9}} = \frac{40}{3} = 13\tfrac{1}{3}. \textit{ Ans.}$$

48. At $8.75 per M, how many bricks can be bought for $393.75?

$$\begin{array}{r} 45000 \\ 875\overline{)39375000} \\ \underline{3500} \\ 4375 \\ \underline{4375} \end{array}$$

45,000. *Ans.*

49. When 1000 bricks cost $7.20, what is the cost of a single brick?

$$\begin{array}{r} 1000\underline{)\,7.200} \\ 0.0072 \end{array}$$

$0.0072. *Ans.*

50. If $437.645 be paid for 6500 feet of rosewood, what is the cost per M?

$$\frac{65\cancel{00}}{10\cancel{00}} = 6.5.$$

$$\begin{array}{r} 67.33 \\ 65\overline{)4376.45} \\ \underline{390} \\ 476 \\ \underline{455} \\ 214 \\ \underline{195} \\ 195 \\ \underline{195} \end{array}$$

$67.33. *Ans.*

51. A sea captain who owned $\frac{3}{5}$ of a ship and cargo, gave to his wife $\frac{1}{3}$ of his share, to his daughter $\frac{1}{2}$ of what his wife received, to his son $\frac{2}{3}$ of the remainder, and equally divided what was still left between two nieces. What part of the whole had each niece?

$\frac{1}{\cancel{3}}$ of $\frac{\cancel{3}}{5} = \frac{1}{5}$ = wife's share.

$\frac{1}{2}$ of $\frac{1}{5} = \frac{1}{10}$ = daughter's share.

$\frac{3}{5} - (\frac{1}{5} + \frac{1}{10}) = \frac{6}{10} - \frac{3}{10} = \frac{3}{10}$.

$\frac{\cancel{2}}{\cancel{3}}$ of $\frac{\cancel{3}}{\underset{5}{\cancel{10}}} = \frac{1}{5}$ = son's share.

$\frac{1}{5} + \frac{1}{10} + \frac{1}{5} = \frac{5}{10} = \frac{1}{2}$.

$\frac{3}{5} - \frac{1}{2} = \frac{1}{10}$, amount divided between nieces.

$\frac{1}{2}$ of $\frac{1}{10} = \frac{1}{20}$, share of each niece. *Ans.*

52. Peter Knowlton sold a farm for $9786, which was $\frac{5}{8}$ of the sum paid for it. Required the original cost of the farm.

$$\$9786 \div \tfrac{5}{8} = \$9786 \times \tfrac{8}{5} = \frac{\$78288}{5} = \$15657\tfrac{3}{5} = \$15,657.60.\ \textit{Ans.}$$

53. A merchant bought a bag of coffee, containing 60 pounds, for $15. At what advance must he sell it per pound to buy 3 yards of velvet at $3 per yard with the gain on the coffee?

$$\begin{array}{r} 6\cancel{0}\underline{)\,15.\cancel{0}} \\ 0.25 \end{array} \qquad \begin{array}{r} \$3 \\ \underline{3} \\ \$9 \\ \underline{15} \\ \$24 \end{array} \qquad \begin{array}{r} 6\cancel{0}\underline{)\,\$24.\cancel{0}} \\ \$0.40 \\ \underline{-\,0.25} \\ \$0.15\ \textit{Ans.} \end{array}$$

54. After selling $\frac{2}{3}$ of his sheep to a drover, and $\frac{1}{3}$ of the remainder to his neighbor, a farmer has 150 left. How many were there in the flock at first?

If $\frac{2}{3}$ of the sheep were sold, $\frac{1}{3}$ remained. If $\frac{1}{3}$ of the remainder was sold, then there remained $\frac{2}{3}$ of $\frac{1}{3} = \frac{2}{9}$. Hence, $\frac{2}{9} = 150$.

$$150 + \frac{2}{9} = \overset{75}{\cancel{150}} \times \frac{9}{\cancel{2}} = 675. \textit{ Ans.}$$

55. A stock broker bought 9 shares in the Northern Pacific Railroad, at $99\frac{1}{2}$, and 12 shares in the Illinois Central Railroad, at \$$102\frac{1}{2}$. He sold them all at \$$103\frac{1}{4}$. How much did he gain?

$$\begin{array}{r} \$99\frac{1}{2} \\ 9 \\ \hline \$895\frac{1}{2} \end{array} \qquad\qquad 9 + 12 = 21 \text{ shares.}$$

$$\begin{array}{r} \$102\frac{1}{2} \\ 12 \\ \hline \$1230. \\ +\,895.50 \\ \hline \$2125.50 \end{array} \qquad\qquad \begin{array}{rl} \$103.25 & \\ 21 & \\ \hline 10325 & \\ 20650 & \\ \hline \$2168.25 & \text{sum received.} \\ -\,2125.50 & \\ \hline \$42.75 & \textit{Ans.} \end{array}$$

56. A bankrupt's available property can be sold for \$19,780, which will pay $62\frac{1}{2}$ cents on every dollar he owes. How much does he owe?

$$\begin{array}{r} 31648 \\ 625\overline{)19780000} \\ 1875 \\ \hline 1030 \\ 625 \\ \hline 4050 \\ 3750 \\ \hline 3000 \\ 2500 \\ \hline 5000 \\ 5000 \\ \hline \end{array} \qquad \$31{,}648 \textit{ Ans.}$$

57. A loaf of bread weighing 2 pounds, when flour is worth \$9.80 per barrel, is sold for 10 cents. What should it bring when flour is worth \$7.84?

$$\frac{\overset{8}{\cancel{784}}}{\underset{\cancel{98}}{\cancel{980}}} \times \frac{\cancel{10}}{1} = 8. \qquad 8 \text{ cents. } \textit{Ans.}$$

58. Divide 0.75 of $17\frac{5}{8}$ by $\frac{4}{5}$ of 0.035.

$$0.75 = \tfrac{3}{4}.$$

$$\tfrac{3}{4} \text{ of } 17\tfrac{5}{8} = \tfrac{3}{4} \text{ of } \tfrac{141}{8} = \tfrac{423}{32}.$$

$$\frac{4}{\cancel{5}} \times \frac{\overset{0.007}{\cancel{0.035}}}{1} = 0.028$$

$$\frac{423}{32} \times \frac{1}{0.028} = \frac{423}{0.896} = 472.1. \textit{ Ans.}$$

59. An army of 7844 men has 490,250 pounds of beef. If for every man $1\frac{1}{4}$ pounds daily be allowed, in how many days will the beef be consumed?

$$\begin{array}{r}
7844 \\
\underline{1\tfrac{1}{4}} \\
1961 \\
\underline{7844 \qquad 50} \\
9805)\,490250 \\
\underline{\underline{49025}}
\end{array} \qquad 50. \textit{ Ans.}$$

60. A seedsman bought $37\frac{2}{3}$ bushels of lawn grass-seed for \$226. He sold 25 bushels at a profit of $\$1\frac{2}{5}$ per bushel. For what price per bushel must he sell the remainder to make his whole gain \$73?

$$\$226 \div 37\tfrac{2}{3} = \$226 \div \tfrac{113}{3} = \$\overset{2}{\cancel{226}} \times \frac{3}{\cancel{113}} = \$6, \text{ what he paid a bushel.}$$

If he gained $\$1\frac{2}{5}$ per bushel, he received per bushel $\$6 + \$1\frac{2}{5} = \$7\frac{2}{5}$; and, on 25 bushels, he received \$185. If his whole gain is \$73, he must receive for the whole number of bushels $\$73 + \$226 = \$299$. Then he will receive on the remaining $12\frac{2}{3}$ bushels, $\$299 - \$185 = \$114$; and on each of these $12\frac{2}{3}$ bushels he will receive

$$\$114 \div 12\tfrac{2}{3} = \$114 \div \tfrac{38}{3} = \$\overset{3}{\cancel{114}} \times \frac{3}{\cancel{38}} = \$9. \textit{ Ans.}$$

61. The cost of 50 gallons of molasses is \$25. By leakage $\frac{1}{5}$ of it is lost; 20 gallons are sold at $62\frac{1}{2}$ cents. At what rate must the remainder be sold to gain \$5 on the whole?

$\frac{1}{5}$ of $50 = 10$, number of gallons lost.

$20 \times \$0.625 = \$12.50.$

If 20 gallons are sold and 10 are lost, then 20 gallons remain. To gain \$5 on the whole, the sale must bring \$30. $\$30 - \$12.50 = \$17.50$. If 20 gallons are sold for \$17.50, one gallon is sold for

$$\$17.50 \div 20 = \$0.875. \text{ Ans.}$$

62. For $\frac{2}{3}$ of a yard of broadcloth at $\$6\frac{1}{2}$ per yard, $1\frac{3}{4}$ yards of cassimere and 50 cents in money were given in exchange. What was the price per yard of the cassimere?

$\frac{2}{3}$ of $\$6\frac{1}{2} = \frac{\cancel{2}}{3}$ of $\frac{\$13}{\cancel{2}} = \frac{\$13}{3} = \$4.33\frac{1}{3}$, value of broadcloth.

$\$4.33\frac{1}{3} - \$0.50 = \$3.83\frac{1}{3}$, value of cassimere.

If $1\frac{3}{4}$ yards are valued at $\$3.83\frac{1}{3}$, one yard will be valued at

$$\$3.83\tfrac{1}{3} \div 1\tfrac{3}{4} = \frac{\$11.50}{3} \div \frac{7}{4} = \frac{\$11.50}{3} \times \frac{4}{7} = \frac{\$46}{21} = \$2.19. \text{ Ans.}$$

63. A owns $\frac{3}{5}$ of a ship and cargo worth \$25,748, B $\frac{1}{4}$ of the remainder, C $\frac{1}{8}$ of the amount belonging to A and B, and D owns what is still left. Required the amount of D's share.

If A owns $\frac{3}{5}$, there remains $\frac{2}{5}$. If B owns $\frac{1}{4}$ of this remainder, B owns

$$\frac{1}{\underset{2}{\cancel{4}}} \text{ of } \frac{\cancel{2}}{5} = \frac{1}{10}.$$

If C owns $\frac{1}{8}$ of the amount belonging to A and B, then C owns

$$\tfrac{1}{8} \text{ of } (\tfrac{3}{5} + \tfrac{1}{10}) = \tfrac{1}{8} \text{ of } \tfrac{7}{10} = \tfrac{7}{80}.$$

If D owns what is left, D owns

$$1 - (\tfrac{3}{5} + \tfrac{1}{10} + \tfrac{7}{80}) = \tfrac{80}{80} - \tfrac{63}{80} = \tfrac{17}{80}.$$

$$\frac{17}{\underset{20}{\cancel{80}}} \text{ of } \frac{\overset{6437}{\cancel{\$25748}}}{1} = \frac{\$109429}{20} = \$5471.45, \text{ D's share. Ans.}$$

64. A farmer gives to his eldest son $\frac{19}{25}$ of a farm, and the remainder to his daughter. The difference between their shares is 780 acres. How many acres does the daughter receive?

If $\frac{19}{25}$ is given to the son, and the remainder to the daughter, then

$$\tfrac{25}{25} - \tfrac{19}{25} = \tfrac{6}{25} \text{ is her share.}$$

The difference between their shares, or $\frac{19}{25} - \frac{6}{25} = \frac{13}{25}$, is 780 acres.

$$780 \div \tfrac{13}{25} = \overset{60}{\cancel{780}} \times \frac{25}{\cancel{13}} = 1500, \text{ the whole number of acres.}$$

$$\frac{6}{\cancel{25}} \text{ of } \overset{60}{\cancel{1500}} = 360, \text{ the daughter's share. Ans.}$$

65. If 1200 pounds can be carried 36 miles for $14, how many pounds can be carried 24 miles for $14?

$$\frac{\overset{50}{\cancel{1200}} \times 36}{\cancel{24}} = 1800. \text{ \textit{Ans.}}$$

66. When $2\frac{1}{2}$ acres of land cost $500, what will be paid for 460 acres?

$$\$500 \div 2\tfrac{1}{2} = \$500 \div \tfrac{5}{2} = \$\overset{100}{\cancel{500}} \times \frac{2}{\cancel{5}} = \$200, \text{ price per acre.}$$

$$460 \times \$200 = \$92{,}000. \text{ \textit{Ans.}}$$

67. Four and four-sevenths tons of cannel coal cost $64. Required the cost of $13\frac{5}{7}$ tons.

$$13\tfrac{5}{7} \div 4\tfrac{4}{7} = 96 \div 32 = 3.$$

Hence $13\frac{5}{7}$ tons will cost 3 times as much as $4\frac{4}{7}$ tons, and

$$3 \times \$64 = \$192. \text{ \textit{Ans.}}$$

68. Of a certain estate $\frac{1}{5}$ is pasture, $\frac{3}{8}$ land suitable for cultivation, and the remainder, woodland, is 50 acres. How many acres in the estate?

$$\tfrac{1}{5} + \tfrac{3}{8} = \tfrac{8}{40} + \tfrac{15}{40} = \tfrac{23}{40}.$$

$$\tfrac{40}{40} - \tfrac{23}{40} = \tfrac{17}{40}, \text{ woodland.}$$

$$50 = \tfrac{17}{40}.$$

$$50 \div \tfrac{17}{40} = 50 \times \tfrac{40}{17} = \tfrac{2000}{17} = 117\tfrac{11}{17}. \text{ \textit{Ans.}}$$

69. If 1.4 bushels of walnuts cost $1.50, find the value of 7 bushels.

$$7 \div 1.4 = 5; \text{ and } 5 \times \$1.50 = \$7.50. \text{ \textit{Ans.}}$$

70. A man on the average breathes 17 times in a minute, and takes in at each breath about $\frac{5}{7}$ of a quart of air. How many quarts of air are needed for a man in 1 hour?

$$17 \times \tfrac{5}{7} = \tfrac{85}{7}, \text{ number of quarts of air needed in 1 minute.}$$

$$60 \times \tfrac{85}{7} = \tfrac{5100}{7} = 728\tfrac{4}{7}, \text{ quarts of air needed in 1 hour. \textit{Ans.}}$$

71. If the crop of potatoes from an acre is on the average 255 bushels, but the potato beetle destroys $\frac{2}{5}$ of the crop, how many bushels may be expected from $3\frac{2}{7}$ acres?

If the potato beetle destroys $\frac{2}{5}$, $\frac{3}{5}$ of the crop is left.

$$\frac{3}{\cancel{5}} \text{ of } \frac{\overset{51}{\cancel{255}}}{1} = 153 = \text{number of bushels on one acre.}$$

$$3\tfrac{2}{7} \times 153 = \tfrac{23}{7} \times 153 = \tfrac{3519}{7} = 502\tfrac{5}{7}. \textit{ Ans.}$$

72. If a miller takes $\frac{1}{16}$ for toll, and a bushel of wheat produces 40 pounds of flour, how many bushels must be carried to the mill to obtain 196 pounds of flour?

$$\frac{1}{\underset{2}{\cancel{16}}} \text{ of } \frac{\overset{5}{\cancel{40}}}{1} = \frac{5}{2} = 2\tfrac{1}{2}, \text{ toll.}$$

$40 - 2\frac{1}{2} = 37\frac{1}{2}$, what is left to one bushel.

$196 \div 37\frac{1}{2} = 196 \times \frac{2}{75} = \frac{392}{75} = 5\frac{17}{75}$. *Ans.*

73. An expressman carried 100 vases, on the condition that he was to receive $\frac{1}{4}$ of a dollar for every one he carried without breaking, and pay $1\frac{1}{4}$ dollars for every one he broke. He received 16 dollars. How many did he break?

The expressman would have received \$25 if no vase had been broken. He loses, therefore, \$25 − \$16 = \$9 by broken vases. He loses on each one $\$\frac{1}{4} + \$1\frac{1}{4} = \$1\frac{1}{2}$. Hence the number broken equals $9 \div 1\frac{1}{2} = 6$. *Ans.*

74. A man who rows 4 miles an hour in still water takes $1\frac{1}{5}$ hours to row 4 miles up a river. How many minutes will it take him to row 4 miles down the river?

The man could row in still water $4\frac{4}{5}$ miles in $1\frac{1}{5}$ hours. Hence the current sets him back $\frac{4}{5}$ of a mile in $1\frac{1}{5} = \frac{6}{5}$ hours. Therefore the rate of the current per hour is $\frac{4}{5} \div \frac{6}{5} = \frac{2}{3}$ miles.

When he rows down the river, he will go at the rate of $4\frac{2}{3}$ miles an hour.

Therefore to row 4 miles down the river it will take him

$$4 \div 4\tfrac{2}{3} = 4 \div \tfrac{14}{3} = \tfrac{6}{7} \text{ of an hour} = 51\tfrac{3}{7} \text{ minutes. } \textit{Ans.}$$

Ex. 98. (*Oral.*) Page 156.

1. How many inches in 1 yd.? in $\frac{1}{3}$ yd.? in $\frac{1}{4}$ yd.? 36; 12; 9.
2. How many yards in 180 in.? in 48 in.? in 45 in.? 5; $1\frac{1}{3}$; $1\frac{1}{4}$.
3. How many yards in 3 rds.? in 4 rds.? in 5 rds.? $16\frac{1}{2}$; 22; $27\frac{1}{2}$.

4. How many feet in 2 yds.? in 2 rds.? in 2 rds. 2 yds.? 6; 33; 39.

5. How many rods in 33 ft.? How many yards in 33 ft.? 2; 11.

6. In ¼ mi. how many rods? yards? feet? 80; 440; 1320.

7. How many rods in 0.4 of a mile? in 0.3? in 0.7? 128; 96; 224.

8. What part of a mile are 160 rds.? 80 rds.? 40 rds.? ½; ¼; ⅛.

9. What part of a foot are 4 in.? 3 in.? 6 in.? 8 in.? ⅓; ¼; ½; ⅔.

10. What part of a yard are 2 ft.? 1 ft. 6 in.? 2 ft. 6 in.? ⅔; ½; ⅚.

Ex. 99. Page 156.

1. Reduce 3 mi. 5 yds. 2 ft. to feet.

$$\begin{array}{rl} 3 & \text{mi. 5 yds. 2 ft.} \\ 1760 & \\ \hline 5280 & \\ 5 & \\ \hline 5285 & \\ 3 & \\ \hline 15855 & \\ 2 & \\ \hline 15{,}857 & \textit{Ans.} \end{array}$$

2. Reduce 40 mi. 5 rds. 2½ yds. to feet.

$$\begin{array}{rl} 40 & \text{mi. 5 rds. } 2\tfrac{1}{2}\text{ yds.} \\ 320 & \\ \hline 12800 & \\ 5 & \\ \hline 12805 & \\ 5\tfrac{1}{2} & \\ \hline 6402\tfrac{1}{2} & \\ 64025 & \\ \hline 70427\tfrac{1}{2} & \\ 2\tfrac{1}{2} & \\ \hline 70430 & \\ 3 & \\ \hline 211{,}290 & \textit{Ans.} \end{array}$$

3. Reduce 2 mi. 52 rds. 1 ft. to feet.

$$\begin{array}{rl} 2 & \text{mi. 52 rds. 1 ft.} \\ 320 & \\ \hline 640 & \\ 52 & \\ \hline 692 & \\ 16\tfrac{1}{2} & \\ \hline 346 & \\ 4152 & \\ 692 & \\ \hline 11418 & \\ 1 & \\ \hline 11{,}419 & \textit{Ans.} \end{array}$$

4. Reduce 18 mi. 252 rds. 2 yds. to inches.

$$\begin{array}{rl} 18 & \text{mi. 252 rds. 2 yds.} \\ 320 & \\ \hline 360 & \\ 54 & \\ \hline 5760 & \\ 252 & \\ \hline 6012 & \\ 5\tfrac{1}{2} & \\ \hline 3006 & \\ 30060 & \\ \hline 33066 & \\ 2 & \\ \hline 33068 & \\ 36 & \\ \hline 198408 & \\ 99204 & \\ \hline 1{,}190{,}448 & \textit{Ans.} \end{array}$$

5. Reduce 11 mi. 6 rds. 4 yds. to inches.

11 mi. 6 rds. 4 yds.
320
220
33
3520
6
3526
5½
1763
17630
19393
4
19397
36
116382
58191
698,292 *Ans.*

6. Reduce 18 mi. 230 rds. 8 ft. to inches.

18 mi. 230 rds. 8 ft.
320
360
54
5760
230
5990
16½
2995
35940
5990
98835
8
98843
12
197686
98843
1,186,116 *Ans.*

7. Reduce 2 yds. 1 ft. 9 in. to inches.

2 yds. 1 ft. 9 in.
3
6
1
7
12
84
9
93 *Ans.*

8. Reduce 5 yds. 2 ft. 7 in. to inches.

5 yds. 2 ft. 7 in.
3
15
2
17
12
34
17
204
7
211 *Ans.*

9. Reduce 170 rds. 3 yds. 9 in. to inches.

170 rds. 3 yds. 9 in.
5½
85
850
935
3
938
36
5628
2814
33768
9
33,777 *Ans.*

10. Reduce 8 mi. 96 rds. 4 yds. to inches.

8 mi. 96 rds. 4 yds.
320
2560
96
2656
5½
1328
13280
14608
4
14612
36
87672
43836
526,032 *Ans.*

11. Reduce 2 mi. 80 rds. 2 ft. to inches.

2 mi. 80 rds. 2 ft.
320
640
80
720
16½
360
4320
720
11880
2
11882
12
23764
11882
142,584 *Ans.*

12. Reduce 200 rds. 115 yds. 5 in. to inches.

200 rds. 115 yds. 5 in.
5½
100
1000
1100
115
1215
36
7290
3645
43740
5
43,745 *Ans.*

Ex. 100. Page 158.

1. Reduce 211 in. to higher denominations.

12 | 211 in.
3 | 17 ft. . . . . 7 in.
5 yds. . . . . 2 ft.

5 yds. 2 ft. 7 in. *Ans.*

2. Reduce 33,777 in. to higher denominations.

12	33777 in.	
3	2814 ft.	9 in.
5½	938 yds.	
2	2	
11	1876	half-yards.
	170 rds.	6 half-yards = 3 yds.

170 rds. 3 yds. 9 in. *Ans.*

3. Reduce 142,737 in. to higher denominations

12	142737 in.	
3	11894 ft.	9 in.
5½	3964 yds.	2 ft.
2	2	
11	7928	half-yards.
320	720 rds.	8 half-yards = 4 yds.
	2 mi.	80 rds.

2 mi. 80 rds. 4 yds. 2 ft. 9 in. *Ans.*

4. Reduce 33,000 ft. to higher denominations.

3	33000 ft.	
5½	11000 yds.	
2	2	
11	22000	half-yards.
320	2000 rds.	
	6 mi.	80 rds.

6 mi. 80 rds. *Ans.*

5. Reduce 125,899 in. to higher denominations.

12	125899 in.	
3	10491 ft.	7 in.
5½	3497 yds.	
2	2	
11	6994	half-yards.
320	635 rds.	9 half-yards = 4½ yds.
	1 mi.	315 rds.

mi.	rds.	yds.	ft.	in.
1	315	4		7
			1	6
1	315	4	2	1

1 mi. 315 rds. 4 yds. 2 ft. 1 in. *Ans.*

6. Reduce 179,875 in. to higher denominations.

12	179875 in.	
3	14989 ft.	7 in.
5½	4996 yds..	1 ft.
2	2	
11	9992	half-yards.
320	908 rds.	4 half-yards = 2 yds.
	2 mi.	268 rds.

2 mi. 268 rds. 2 yds. 1 ft. 7 in. *Ans.*

7. Reduce 87,476 ft. to higher denominations.

3	87476 ft.	
5½	29158 yds.	2 ft.
2	2	
11	58316	half-yards.
320	5301 rds.	5 half-yards = 2½ yds.
	16 mi.	181 rds.

mi.	rds.	yds.	ft.	in.
16	181	2	2	
			1	6
16	181	3	0	6

16 mi. 181 rds. 3 yds. 6 in. *Ans.*

8. Reduce 97,378 yds. to higher denominations.

5½	97378 yds.	
2	2	
11	194756	half-yards.
320	17705 rds..	1 half-yd.
	55 mi.	105 rds..

mi.	rds.	yds.	ft.	in.
55	105	0		
			1	6
55	105	0	1	6

55 mi. 105 rds. 1 ft. 6 in. *Ans.*

9. Reduce 348,164 in. to higher denominations.

12 | 348164 in.
3 | 29013 ft. . . . . 8 in.
5½ | 9671 yds.
2 | 2
11 | 19342 . . . . half-yards.
320 | 1758 rds. . . . . 4 half-yards = 2 yds.
5 mi. . . . . 158 rds.
5 mi. 158 rds. 2 yds. 8 in. *Ans.*

10. Reduce 247,391 in. to higher denominations.

12 | 247391 in.
3 | 20615 ft. . . . . 11 in.
5½ | 6871 yds. . . . . . . 2 ft.
2 | 2
11 | 13742 . . . . half-yards.
320 | 1249 rds. . . . . 3 half-yards = 1½ yds.
3 mi. . . . . 289 rds.

mi.	rds.	yds.	ft.	in.
3	289	1	2	11
			1	6
3	289	2	1	5

3 mi. 289 rds. 2 yds. 1 ft. 5 in. *Ans.*

11. Reduce 99,204 ft. to higher denominations.

3 | 99204 ft.
5½ | 33068 yds.
2 | 2
11 | 66136 . . . . half-yards.
320 | 6012 rds. . . . . 4 half-yards = 2 yds.
18 mi. . . . . 252 rods.
18 mi. 252 rds. 2 yds. *Ans.*

12. Reduce 11,220 ft. to higher denominations.

3 | 11220 ft.
5½ | 3740 yds.
2 | 2
11 | 7480 . . . . half-yards.
320 | 680 rds.
2 mi. . . . . 40 rds.
2 mi. 40 rds. *Ans.*

Ex. 101. Page 159.

Add:

1.

yds.	ft.	in.
15	1	7
23	2	9
35	0	6
7	2	11
82	3)7	12)33
	2 – 1 rem.	2 – 9 rem.

82 yds. 1 ft. 9 in. *Ans.*

2.

rds.	yds.	ft.
23	3	1
18	4	2
27	0	2
6	4	0
76	5½)12	3)5
	2 – 1 rem.	1 – 2 rem.

76 rds. 1 yd. 2 ft. *Ans.*

3.

mi.	rds.	yds.
17	23	4
9	17	2
23	0	3
11	35	1
60	76	5½)10
		1 – 4½ rem.

mi.	rds.	yds.	ft.	in.
60	76	4½		
		½ =	1	6
60	76	4	1	6

60 mi. 76 rds. 4 yds. 1 ft. 6 in. *Ans.*

4.

mi.	rds.	yds.
37	14	2
28	16	2
19	10	4
10	56	3
94	98	5½)11
		2 – 0 rem.

94 mi. 98 rds. 0 yds. *Ans.*

5.

mi.	rds.	ft.
23	119	15
19	173	11
8	65	12
32	147	8
83	320)506	16½)46
	1 – 186 rem.	2 – 13 rem.

83 mi. 186 rds. 13 ft. *Ans.*

6.

mi.	rds.	ft.	in.
7	95	8	9
8	96	7	8
3	98	9	9
6	87	8	7
25	58	1	9

25 mi. 58 rds. 1 ft. 9 in. *Ans.*

Find the difference between:

7.

yds.	ft.	in.
14	1	4
10	2	11
3	1	5

3 yds. 1 ft. 5 in. *Ans.*

8.

rds.	yds.	ft.	
22	2	0	
19	3	2	
2	3½	1	
	½ =	1	6 in.
2	3	2	6

2 rds. 3 yds. 2 ft. 6 in. *Ans.*

9.

mi.	rds.	ft.	
23	76	1	
6	157	2	
16	238	15½	
		½ =	6 in.
16	238	15	6

16 mi. 238 rds. 15 ft. 6 in. *Ans.*

10.

mi.	rds.	ft.	in.
17	125	1	10
8	187	2	11
8	257	14½	11
		½ =	6
8	257	15	5

8 mi. 257 rds. 15 ft. 5 in. *Ans.*

11.

mi.	rds.	yds.	ft.	
7	0	0	0	
3	64	3	2	
3	255	1½	1	
		½ =	1	6 in.
3	255	1	2	6

3 mi. 255 rds. 1 yd. 2 ft. 6 in. *Ans.*

12.

mi.	rds.	yds.	ft.	in.
13	33	2	0	0
9	32	4	0	0
4	0	3½	0	0
		½ =	1	6
4	0	3	1	6

4 mi. 0 rds. 3 yds. 1 ft. 6 in. *Ans.*

Ex. 102. Page 161.

1. Multiply 33 yds. 2 ft. 11 in. by 17.

yds.	ft.	in.
33	2	11
		17
577	1	7

17 × 11 in. = 187 in. = $\frac{187}{12}$ ft. = 15 ft. 7 in.
17 × 2 ft. = 34 ft.; 34 ft. + 15 ft. = 49 ft. = $\frac{49}{3}$ yds. = 16 yds. 1 ft.
17 × 33 yds. = 561 yds.; 561 yds. + 16 yds. = 577 yds.
577 yds. 1 ft. 7 in. *Ans.*

2. Multiply 23 rds. 3 yds. 2 ft. by 100.

$$\begin{array}{rrrr} & \text{rds.} & \text{yds.} & \text{ft.} \\ & 23 & 3 & 2 \\ & & & 10 \\ \hline & 236 & 3 & 2 \\ & & & 10 \\ \hline \text{7 mi.} & 126 & 3 & 2 \end{array}$$

10 × 2.ft. = 20 ft. = $\frac{20}{3}$ yds. = 6 yds. 2 ft.

10 × 3 yds. = 30 yds.; 30 yds. + 6 yds. = 36 yds. = $\frac{36}{5\frac{1}{2}}$ rds.
= 6 rds. 3 yds.

10 × 23 rds. = 230 rds.; 230 rds. + 6 rds. = 236 rds.

10 × 2 ft. = 20 ft. = $\frac{20}{3}$ yds. = 6 yds. 2 ft.

10 × 3 yds. = 30 yds.; 30 yds. + 6 yds. = 36 yds. = $\frac{36}{5\frac{1}{2}}$ rds.
= 6 rds. 3 yds.

10 × 236 rds. = 2360 rds.; 2360 rds. + 6 rds. = 2366 rds. = $\frac{2366}{320}$ mi.
= 7 mi. 126 rds.

7 mi. 126 rds. 3 yds. 2 ft. *Ans.*

3. Divide 15 yds. 1 ft. 9 in. by 3.

$$\begin{array}{rrrr} & \text{yds.} & \text{ft.} & \text{in.} \\ 3) & 15 & 1 & 9 \\ \hline & 5 & 0 & 7 \end{array}$$

15 yds. ÷ 3 = 5 yds.

1 ft. ÷ 3 = $\frac{12}{3}$ in.; $\frac{12}{3}$ + $\frac{9}{3}$ in. = $\frac{21}{3}$ = 7 in.

5 yds. 7 in. *Ans.*

4. Divide 289 yds. 2 ft. 9 in. by 213.

$$\begin{array}{rrrr} & \text{yds.} & \text{ft.} & \text{in.} \\ 213) & 289 & 2 & 9 \\ \hline & 1 & 1 & 1 \end{array}$$

$\frac{289}{213}$ yds. = 1 yd. + $\frac{76}{213}$ yds.

$\frac{76}{213}$ yds. = $\frac{76 \times 3}{213}$ ft. = $\frac{228}{213}$ ft.; $\frac{228}{213}$ ft. + $\frac{2}{213}$ ft. = $\frac{230}{213}$ ft.
= 1 ft. + $\frac{17}{213}$ ft.

$\frac{17}{213}$ ft. = $\frac{17 \times 12}{213}$ in. = $\frac{204}{213}$ in.; $\frac{204}{213}$ in. + $\frac{9}{213}$ in. = $\frac{213}{213}$ in. = 1 in.

1 yd. 1 ft. 1 in. *Ans.*

5. Divide 150 mi. 178 rds. 3 yds. by 9.

$$\begin{array}{r|rrrrr}
 & \text{mi.} & \text{rds.} & \text{yds.} & \text{ft.} & \text{in.} \\
9) & 150 & 178 & 3 & 0 & 0 \\
\hline
 & 16 & 233 & 0 & 2 & 10
\end{array}$$

$\frac{150}{9}$ mi. = 16 mi. + $\frac{6}{9}$ mi.

$\frac{6}{9}$ mi. = $\frac{6 \times 320}{9}$ rds. = $\frac{1920}{9}$ rds.; $\frac{1920}{9}$ rds. + $\frac{178}{9}$ rds. = $\frac{2098}{9}$ rds.
= 233 rds. + $\frac{1}{9}$ rd.

$\frac{1}{9}$ rd. = $\frac{1 \times 5\frac{1}{2}}{9}$ yd. = $\frac{5\frac{1}{2}}{9}$ yd.; $\frac{5\frac{1}{2}}{9}$ yd. + $\frac{3}{9}$ yd. = $\frac{8\frac{1}{2}}{9}$ yd.

$\frac{8\frac{1}{2}}{9}$ yd. = $\frac{8\frac{1}{2} \times 3}{9}$ ft. = $\frac{25\frac{1}{2}}{9}$ ft. = 2 ft. + $\frac{7\frac{1}{2}}{9}$ ft.

$\frac{7\frac{1}{2}}{9}$ ft. = $\frac{7\frac{1}{2} \times 12}{9}$ in. = $\frac{90}{9}$ in. = 10 in.

16 mi. 233 rds. 0 yds. 2 ft. 10 in. *Ans.*

6. Multiply 3 mi. 72 rds. 9 ft. by 11.

$$\begin{array}{rrr}
\text{mi.} & \text{rds.} & \text{ft.} \\
3 & 72 & 9 \\
 & & 11 \\
\hline
35 & 158 & 0
\end{array}$$

11 × 9 ft. = 99 ft. = $\frac{99}{16\frac{1}{2}}$ rds. = 6 rds. 0 ft.

11 × 72 rds. = 792 rds.; 792 rds. + 6 rds. = 798 rds. = $\frac{798}{320}$ mi.
= 2 mi. 158 rds.

11 × 3 mi. = 33 mi.; 33 mi. + 2 mi. = 35 mi.

35 mi. 158 rds. 0 ft. *Ans.*

7. Multiply 150 rds. 2 yds. 1 ft. by 235.

$$\begin{array}{rrrrr}
 & \text{rds.} & \text{yds.} & \text{ft.} & \text{in.} \\
 & 150 & 2 & 1 & 0 \\
 & & & & 47 \\
\hline
22 \text{ mi.} & 29 & 4\frac{1}{2} & 2 & 0 \\
 & & \frac{1}{2} & =1 & 6 \\
\hline
22 & 29 & 5 & 0 & 6 \\
 & & & & 5 \\
\hline
110 & 149 & 3 & 2 & 6
\end{array}$$

235 = 47 × 5.

47 × 1 ft. = 47 ft. = $\frac{47}{3}$ yds. = 15 yds. 2 ft.

47 × 2 yds. = 94 yds; 94 yds. + 15 yds. = 109 yds. = $\frac{109}{5\frac{1}{2}}$ rds.
= 19 rds. $4\frac{1}{2}$ yds.

47×150 rds. $= 7050$ rds.; 7050 rds. $+ 19$ rds. $= 7069$ rds. $= \frac{7069}{320}$ mi.
$= 22$ mi. 29 rds.

5×6 in. $= 30$ in. $= \frac{30}{12}$ ft. $= 2$ ft. 6 in.

5×5 yds. $= 25$ yds. $= \dfrac{25}{5\frac{1}{2}}$ rds. $= 4$ rds. 3 yds.

5×29 rds. $= 145$ rds.; 145 rds. $+ 4$ rds. $= 149$ rds.

5×22 mi. $= 110$ mi.

110 mi. 149 rds. 3 yds. 2 ft. 6 in. *Ans.*

8. Divide 33 mi. 40 rds. by 200.

$$\begin{array}{rrr} & \text{mi.} & \text{rds.} \\ 200) & 33 & 40 \\ \hline & & 53 \end{array}$$

33 mi. $= 33 \times 320$ rds. $= 10560$ rds.; 10560 rds. $+ 40$ rds. $= 10600$ rds.

$\frac{10600}{200}$ rds. $= 53$ rds. *Ans.*

9. Divide 200 mi. 56 rds. 3 yds. 2 ft. by 121.

$$\begin{array}{rrrrrr} & \text{mi.} & \text{rds.} & \text{yds.} & \text{ft.} & \text{in.} \\ 121) & 200 & 56 & 3 & 2 & 0 \\ \hline & 1 & 209 & 2 & 0 & 6 \end{array}$$

$\frac{200}{121}$ mi. $= 1$ mi. $+ \frac{79}{121}$ mi.

$\frac{79}{121}$ mi. $= \dfrac{79 \times 320}{121}$ rds. $= \frac{25280}{121}$ rds.; $\frac{25280}{121}$ rds. $+ \frac{56}{121}$ rds.
$= \frac{25336}{121}$ rds. $= 209$ rds. $+ \frac{47}{121}$ rds.

$\frac{47}{121}$ rds. $= \dfrac{47 \times 5\frac{1}{2}}{121}$ yds. $= \dfrac{258\frac{1}{2}}{121}$ yds.; $\dfrac{258\frac{1}{2}}{121}$ yds. $+ \dfrac{3}{121}$ yds.
$= \dfrac{261\frac{1}{2}}{121}$ yds. $= 2$ yds. $+ \dfrac{19\frac{1}{2}}{121}$ yds.

$\dfrac{19\frac{1}{2}}{121}$ yds. $= \dfrac{19\frac{1}{2} \times 3}{121}$ ft. $= \dfrac{58\frac{1}{2}}{121}$ ft.; $\dfrac{58\frac{1}{2}}{121}$ ft. $+ \dfrac{2}{121}$ ft. $= \dfrac{60\frac{1}{2}}{121}$ ft.

$\dfrac{60\frac{1}{2}}{121}$ ft. $= \dfrac{60\frac{1}{2} \times 12}{121}$ in. $= \dfrac{726}{121}$ in. $= 6$ in.

1 mi. 209 rds. 2 yds. 0 ft. 6 in. *Ans.*

10. Multiply 11 mi. 200 rds. by 14.

$$\begin{array}{rr} \text{mi.} & \text{rds.} \\ 11 & 200 \\ & 14 \\ \hline 162 & 240 \end{array}$$

14×200 rds. $= 2800$ rds. $= \frac{2800}{320}$ mi. $= 8$ mi. 240 rds.

14×11 mi. $= 154$ mi.; 154 mi. $+ 8$ mi. $= 162$ mi.

162 mi. 240 rds. *Ans.*

11. Multiply 52 mi. 1021 yds. by 47.

$$\begin{array}{rr} \text{mi.} & \text{rds.} \\ 52 & 1021 \\ & 47 \\ \hline 2471 & 467 \end{array}$$

47×1021 yds. $= 47987$ yds. $= \frac{47987}{1760}$ mi. $= 27$ mi. 467 yds.

47×52 mi. $= 2444$ mi.; 2444 mi. $+ 27$ mi. $= 2471$ mi.

2471 mi. 467 yds. *Ans.*

12. Divide 43 mi. 280 rds. by 24.

$$\begin{array}{r|rr} & \text{mi.} & \text{rds.} \\ 24 & 43 & 280 \\ \hline & 1 & 265 \end{array}$$

$\frac{43}{24}$ mi. $= 1$ mi. $+ \frac{19}{24}$ mi.

$\frac{19}{24}$ mi. $= \dfrac{19 \times 320}{24}$ rds. $= \frac{6080}{24}$ rds.; $\frac{6080}{24}$ rds. $+ \frac{280}{24}$ rds.

$= \frac{6360}{24}$ rds. $= 265$ rds.

1 mi. 265 rds. *Ans.*

Ex. 103. Page 162

1. Find the value of $\frac{5}{9}$ of a mile.

$\frac{5}{9}$ mi. $= \dfrac{5 \times 320}{9}$ rds. $= 177$ rds. $+ \frac{7}{9}$ rd.

$\frac{7}{9}$ rd. $= \dfrac{7 \times 5\frac{1}{2}}{9}$ yds. $= 4$ yds. $+ \frac{5}{18}$ yd.

$\frac{5}{18}$ yd. $= \dfrac{5 \times 3}{18}$ ft. $= 0$ ft. $+ \frac{5}{6}$ ft.

$\frac{5}{6}$ ft. $= \dfrac{5 \times 12}{6}$ in. $= 10$ in.

177 rds. 4 yds. 0 ft. 10 in. *Ans.*

2. Find the value of $\frac{2}{7}$ of a mile.

$\frac{2}{7}$ mi. $= \dfrac{2 \times 320}{7}$ rds. $= 91$ rds. $+ \frac{3}{7}$ rd.

$\frac{3}{7}$ rd. $= \dfrac{3 \times 5\frac{1}{2}}{7}$ yds. $= 2$ yds. $+ \frac{5}{14}$ yd.

$\frac{5}{14}$ yd. $= \dfrac{5 \times 3}{14}$ ft. $= 1$ ft. $+ \frac{1}{14}$ ft.

$\frac{1}{14}$ ft. $= \dfrac{1 \times 12}{14}$ in. $= \frac{6}{7}$ in.

91 rds. 2 yds. 1 ft. $\frac{6}{7}$ in. *Ans.*

3. Find the value of $\frac{5}{9}$ mi. – $\frac{5}{7}$ rd.

$\frac{5}{9}$ mi. $= \frac{5 \times 320}{9}$ rds. $= 177\frac{7}{9}$ rds.

$177\frac{7}{9}$ rds. – $\frac{5}{7}$ rds. $= 177\frac{4}{63}$ rds.

$\frac{4}{63}$ rds. $= \frac{4 \times 11}{63 \times 2}$ yds. $=$ 0 yds. $+ \frac{22}{63}$ yds.

$\frac{22}{63}$ yds. $= \frac{22 \times 3}{63}$ ft. $=$ 1 ft. $+ \frac{1}{21}$ ft.

$\frac{1}{21}$ ft. $= \frac{1 \times 12}{21}$ in. $= \frac{4}{7}$ in.

177 rds. 0 yds. 1 ft. $\frac{4}{7}$ in. *Ans.*

4. Find the value of $\frac{3}{16}$ mi. $+ \frac{2}{3}$ of 40 rds. $+ \frac{3}{8}$ yd.

$\frac{3}{16}$ mi. $= \frac{3 \times 320}{16}$ rds. $=$ 60 rds.

$\frac{2}{3}$ of 40 rds. $= \frac{2 \times 40}{3}$ rds. $= 26\frac{2}{3}$ rds.

60 rds. $+ 26\frac{2}{3}$ rds. $= 86\frac{2}{3}$ rds.

$\frac{2}{3}$ rd. $= \frac{2 \times 11}{3 \times 2}$ yds. $= 3\frac{2}{3}$ yds.

$3\frac{2}{3}$ yds. $+ \frac{3}{8}$ yd. $= 4\frac{1}{24}$ yds.

$\frac{1}{24}$ yd. $= \frac{1 \times 3}{24}$ ft. $= \frac{1}{8}$ ft.

$\frac{1}{8}$ ft. $= \frac{1 \times 12}{8}$ in. $= 1\frac{1}{2}$ in.

86 rds. 4 yds. $1\frac{1}{2}$ in. *Ans.*

5. Find the value of 0.475 of a mile.

0.475 mi. $=$ 0.475 × 320 rds. $=$ 152 rds. *Ans.*

6. Find the value of 0.3975 of a mile.

0.3975 mi. $=$ 0.3975 × 320 rds. $=$ 127.2 rds.
0.2 rds. $=$ 0.2 × $5\frac{1}{2}$ yds. $=$ 1.1 yds.
0.1 yd. $=$ 0.1 × 3 ft. $=$ 0.3 ft.
0.3 ft. $=$ 0.3 × 12 in. $=$ 3.6 in.
127 rds. 3 ft. 3.6 in. *Ans.*

7. Find the value of 0.01284 of 14 miles.

14 mi. = 14 × 320 rds. = 4480 rds.
0.01284 × 4480 rds. = 57.52320 rds.
0.5232 rds. = 0.5232 × $5\frac{1}{2}$ yds. = 2.8776 yds.
0.8776 yds. = 0.8776 × 3 ft. = 2.6328 ft.
0.6328 ft. = 0.6328 × 12 in. = 7.5936.
57 rds. 2 yds. 2 ft. 7.5936 in. *Ans.*

8. Find the value of 3.726 mi. − 33.57 rds.

3.726 mi. = 3 mi. + (0.726 × 320) rds. = 3 mi. 232.32 rds.
3 mi. 232.32 rds. − 33.57 rds. = 3 mi. 198.75 rds.
0.75 rds. = 0.75 × $5\frac{1}{2}$ yds. = $4.12\frac{1}{2}$ yds.
$0.12\frac{1}{2}$ yds. = $0.12\frac{1}{2}$ × 3 ft. = $0.37\frac{1}{2}$ ft.
$0.37\frac{1}{2}$ ft. = $0.37\frac{1}{2}$ × 12 in. = 4.5 in.
3 mi. 198 rds. 4 yds. 4.5 in. *Ans.*

9. Find $\frac{3}{5}$ of 5 mi. 89 rds. 3 yds. 2 ft.

	mi.	rds.	yds.	ft.	in.
	5	89	3	2	0
					3
5)	15	269	0	0	0
	3	53	4	1	$2\frac{2}{5}$

3 mi. 53 rds. 4 yds. 1 ft. $2\frac{2}{5}$ in. *Ans.*

10. Take $\frac{2}{5}$ of 4 mi. from $\frac{7}{8}$ of 3 mi. 18 rds. 3 yds. 2 ft.

$\frac{3}{5}$ of 4 mi. = $2\frac{2}{5}$ mi.

$\frac{2}{5}$ mi. = $\frac{2 \times 320}{5}$ rds. = 128 rds.

	mi.	rds.	yds.	ft.	in.
	3	18	3	2	0
					7
8)	21	130	3	2	0
	2	216	1	2	6
	2	128			
		88	1	2	6

88 rds. 1 yd. 2 ft. 6 in. *Ans.*

11. Add 0.525 mi., 0.125 rd., 0.5 yd., 0.16 ft.

0.525 mi.
320
168.000 rds.
0.125
168.125 rds.
$5\frac{1}{2}$
0.6875 yds.
0.5
1.1875 yds.
3
0.5625 ft.
0.16
0.7225 ft.
12
8.6700 in.

168 rds. 1 yd. 8.67 in. *Ans.*

Ex. 104. Page 164.

1. Express 125 rds. 4 yds. 2 ft. 6 in. as the fraction of a mile.

6 in. $= \frac{1}{2}$ ft.

$2\frac{1}{2}$ ft. $= \frac{2\frac{1}{2}}{3} = \frac{5}{6}$ yd.

$4\frac{5}{6}$ yds. $= \frac{4\frac{5}{6}}{5\frac{1}{2}} = \frac{29}{33}$ rd.

$125\frac{29}{33}$ rds. $= \frac{125\frac{29}{33}}{320} = \frac{2077}{5280}$ mi. *Ans.*

2. Express 1 yd. 2 ft. 3 in. as the fraction of 5 yards.

3 in. $= \frac{1}{4}$ ft.

$2\frac{1}{4}$ ft. $= \frac{2\frac{1}{4}}{3} = \frac{3}{4}$ yd.

$\frac{1\frac{3}{4}}{5} = \frac{7}{20}$. *Ans.*

3. Express 51 rds. 1 yd. 3.6 in. as the decimal of a mile.

3.6 in. $= \frac{3.6}{12} = 0.3$ ft.

0.3 ft. $= \frac{0.3}{3} = 0.1$ yd.

1.1 yds. $= \frac{1.1}{5.5} = 0.2$ rd.

51.2 rds. $= \frac{51.2}{320} = 0.16$ mi. *Ans.*

4. Express $\frac{1}{2}$ rd. + $\frac{1}{4}$ yd. as the fraction of a mile.

$\frac{1}{4}$ yd. $= \frac{\frac{1}{4}}{5\frac{1}{2}} = \frac{1}{22}$ rd.

$\frac{1}{2}$ rd. + $\frac{1}{22}$ rd. $= \frac{6}{11}$ rd.

$\frac{6}{11}$ rd. $= \frac{\frac{6}{11}}{320} = \frac{3}{160 \times 11} = \frac{3}{1760}$. *Ans.*

5. Express 3 mi. 53 rds. 4 yds. 1.2 ft. as the decimal of 5 mi. 89 rds. 3 yds. 2 ft.

$1\frac{2}{10}$ ft. $= \frac{1\frac{2}{10}}{3} = \frac{2}{5}$ yd.

$4\frac{2}{5}$ yds. $= \frac{4\frac{2}{5}}{5\frac{1}{2}} = \frac{4}{5}$ rd.

$53\frac{4}{5}$ rds. $= \frac{53\frac{4}{5}}{320} = \frac{269}{1600}$ mi.

2 ft. $= \frac{2}{3}$ yd.

$3\frac{2}{3}$ yds. $= \frac{3\frac{2}{3}}{5\frac{1}{2}} = \frac{2}{3}$ rd.

$89\frac{2}{3}$ rds. $= \frac{89\frac{2}{3}}{320} = \frac{269}{960}$ mi.

$$\frac{3\frac{269}{1600}}{5\frac{269}{960}} = \frac{\cancel{5069}}{\underset{10}{\cancel{1600}}} \times \frac{\overset{6}{\cancel{960}}}{\cancel{5069}} = \frac{6}{10} = 0.6. \quad \textit{Ans.}$$

6. Express 2 mi. 138 rds. 1 yd. as the fraction of 3 mi. 265 rds. $3\frac{1}{2}$ yds.

1 yd. $= \frac{1}{5\frac{1}{2}} = \frac{2}{11}$ rd.

$138\frac{2}{11}$ rds. $= \frac{138\frac{2}{11}}{320} = \frac{19}{44}$ mi.

$3\frac{1}{2}$ yds. $= \frac{3\frac{1}{2}}{5\frac{1}{2}} = \frac{7}{11}$ rd.

$265\frac{7}{11}$ rds. $= \frac{265\frac{7}{11}}{320} = \frac{1461}{1760}$

$$\frac{2\frac{19}{44}}{3\frac{1461}{1760}} = \frac{\cancel{107}}{\cancel{44}} \times \frac{\overset{40}{\cancel{1760}}}{\underset{63}{\cancel{6741}}} = \frac{40}{63}. \quad \textit{Ans.}$$

7. Express 233 rds. 9 ft. 10.8 in. as the decimal of a mile.

10.8 in. $= \frac{10.8}{12} = 0.9$ ft.

$9.9 \text{ ft.} = \frac{9.9}{16.5} = 0.6 \text{ rd.}$

$233.6 \text{ rds.} = \frac{233.6}{320} = 0.73 \text{ mi.}$ *Ans.*

8. Express 3 mi. 242 rds. $2\frac{3}{4}$ yds. as the decimal of 7 mi. 160 rds.

$2.75 \text{ yds.} = \frac{2.75}{5.5} = 0.5 \text{ rd.}$

$242.5 \text{ rds.} = \frac{242.5}{320} = 0.7575 \text{ mi.}$

$160 \text{ rds.} = 0.5 \text{ mi.}$

$\frac{3.7575}{7.5} = 0.501.$ *Ans.*

9. Express 2 ft. $7\frac{1}{2}$ in. as the decimal of 100 yds.

$7.5 \text{ in.} = \frac{7.5}{12} = 0.625 \text{ ft.}$

$2.625 \text{ ft.} = \frac{2.625}{3} = 0.875 \text{ yd.}$

$\frac{0.875}{100} = 0.00875.$ *Ans.*

10. Express 11 rds. 4 yds. $4\frac{1}{2}$ in. as the fraction of a mile.

$4\frac{1}{2} \text{ in.} = \frac{4\frac{1}{2}}{36} = \frac{1}{8} \text{ yd.}$

$4\frac{1}{8} \text{ yds.} = \frac{4\frac{1}{8}}{5\frac{1}{2}} = \frac{3}{4} \text{ rd.}$

$11\frac{3}{4} \text{ rds.} = \frac{11\frac{3}{4}}{320} = \frac{47}{320 \times 4} = \frac{47}{1280} \text{ mi.}$ *Ans.*

11. Express $\frac{7}{8}$ rd. + $\frac{3}{8}$ yd. + $\frac{3}{16}$ ft. as the fraction of a rod.

$\frac{3}{16} \text{ ft.} = \frac{\frac{3}{16}}{3} = \frac{1}{16} \text{ yd.}$

$\frac{1}{16} + \frac{3}{8} = \frac{7}{16}.$

$\frac{7}{16} \text{ yd.} = \frac{\frac{7}{16}}{5\frac{1}{2}} = \frac{7}{88} \text{ rd.}$

$\frac{7}{88} + \frac{7}{8} = \frac{21}{22} \text{ rd.}$ *Ans.*

12. Express 195 yds. 1 ft. 8 in. as the fraction of $\frac{1}{3}$ of a mile.

$8 \text{ in.} = \frac{8}{12} = \frac{2}{3} \text{ ft.}$

$1\frac{2}{3} \text{ ft.} = \frac{1\frac{2}{3}}{3} = \frac{5}{9} \text{ yd.}$

$195\frac{5}{9} \text{ yds.} = \frac{195\frac{5}{9}}{1760} = \frac{1}{9} \text{ mi.}$

$\frac{1}{9} \div \frac{1}{3} = \frac{1}{3}.$ *Ans.*

13. Express 1 mi. 232 rds. 4 yds. 1 ft. 6 in. as the fraction of 8 mi. 204 rds. 0 yd. 1 ft. 6 in.

$6 \text{ in.} = \frac{6}{12} = \frac{1}{2} \text{ ft.}$

$1\frac{1}{2} \text{ ft.} = \frac{1\frac{1}{2}}{3} = \frac{1}{2} \text{ yd.}$

$4\frac{1}{2} \text{ yds.} = \frac{4\frac{1}{2}}{5\frac{1}{2}} = \frac{9}{11} \text{ rd.}$

$232\frac{9}{11} \text{ rds.} = \frac{232\frac{9}{11}}{320} = \frac{2561}{3520} \text{ mi.}$

$6 \text{ in.} = \frac{6}{12} = \frac{1}{2} \text{ ft.}$

$1\frac{1}{2} \text{ ft.} = \frac{1\frac{1}{2}}{16\frac{1}{2}} = \frac{1}{11} \text{ rd.}$

$204\frac{1}{11} \text{ rds.} = \frac{204\frac{1}{11}}{320} = \frac{449}{704} \text{ mi.}$

$$\frac{1\frac{2561}{3520}}{8\frac{449}{704}} = \frac{\cancel{6081}}{\underset{5}{\cancel{3520}}} \times \frac{\cancel{704}}{\cancel{6081}} = \frac{1}{5}. \text{ Ans.}$$

14. Express 127 rds. 3 ft. 3.6 in. as the decimal of a mile.

$3.6 \text{ in.} = \frac{3.6}{12} = 0.3 \text{ ft.}$

$3.3 \text{ ft.} = \frac{3.3}{16.5} = 0.2 \text{ rd.}$

$127.2 \text{ rds.} = \frac{127.2}{320} = 0.3975 \text{ mi.}$ *Ans.*

15. Express 261 rds. 4 yds. 1 ft. 6 in. as the fraction of a mile.

6 in. $= \frac{6}{12} = \frac{1}{2}$ ft.

$1\frac{1}{2}$ ft. $= \dfrac{1\frac{1}{2}}{3} = \frac{1}{2}$ yd.

$4\frac{1}{2}$ yds. $= \dfrac{4\frac{1}{2}}{5\frac{1}{2}} = \frac{9}{11}$ rd.

$261\frac{9}{11}$ rds. $= \dfrac{261\frac{9}{11}}{320} = \frac{9}{11}$ mi. *Ans.*

16. Express $\frac{4}{5}$ of the difference between 3 yds. 2 ft. 11 in. and 10 yds. 7 in. as the fraction of 16 yds.

11 in. $= \frac{11}{12}$ ft.

$2\frac{11}{12}$ ft. $= \dfrac{2\frac{11}{12}}{3} = \frac{35}{36}$ yd.

7 in. $= \frac{7}{36}$ yd.

$10\frac{7}{36} - 3\frac{35}{36} = 6\frac{2}{9}$.

$\frac{4}{5} \times 6\frac{2}{9} = \frac{224}{45}$.

$\dfrac{\frac{224}{45}}{16} = \frac{14}{45}$. *Ans.*

17. Express 7 rds. 1 ft. 3.17 in. as the decimal of 76 rds. 2 yds. 5 in.

3.17 in. $= \dfrac{3\frac{17}{100}}{12} = \frac{317}{1200}$ ft.

$1\frac{317}{1200}$ ft. $= \dfrac{1\frac{317}{1200}}{16\frac{1}{2}} = \dfrac{1517}{\underset{600}{\cancel{1200}}} \times \dfrac{\cancel{2}}{33} = \frac{1517}{19800}$ rd.

5 in. $= \frac{5}{36}$ yd. $\qquad 2\frac{5}{36}$ yds. $= \dfrac{2\frac{5}{36}}{5\frac{1}{2}} = \frac{7}{18}$ rd.

$$\frac{7\frac{1517}{19800}}{76\frac{7}{18}} = \frac{140117}{\underset{1100}{\cancel{19800}}} \times \frac{\cancel{18}}{1375} = \frac{140117}{1512500} = 0.09264. \textit{ Ans.}$$

18. Express 248 rds. 4 yds. 2 ft. 8 in. as the fraction of 2 mi.

8 in. $= \frac{8}{12} = \frac{2}{3}$ ft. $\quad 2\frac{2}{3}$ ft. $= \dfrac{2\frac{2}{3}}{3} = \frac{8}{9}$ yd. $\quad 4\frac{8}{9}$ yds. $= \dfrac{4\frac{8}{9}}{5\frac{1}{2}} = \frac{8}{9}$ rd.

$248\frac{8}{9}$ rds. $= \dfrac{248\frac{8}{9}}{320} = \frac{7}{9}$ mi. $\quad \frac{7}{9} \div 2 = \frac{7}{18}$. *Ans.*

Ex. 105. (*Oral.*) Page 166.

1. How many square feet of surface in a blackboard 4 ft. wide and 9 ft. long? $4 \times 9 = 36$. 36 sq. ft. *Ans.*

2. If a slate is 8 in. wide and has a surface of 80 sq. in., what is the length of the slate? $80 \div 8 = 10$. 10 in. *Ans.*

3. How many square inches in $\frac{1}{4}$ of a square foot? in $\frac{3}{4}$? in $\frac{1}{3}$? in $\frac{5}{6}$? 36; 108; 48; 120.

4. How many square feet in 3 sq. yds.? in 5 sq. yds.? 27; 45.

5. How many square inches in a board 4 in. long and 3 in. wide? $4 \times 3 = 12$. 12 sq. in. *Ans.*

6. A square yard of carpet is 3 ft. long and 3 ft. wide; how many square feet in it? $3 \times 3 = 9$.

7. How many square feet in a yard of carpet 2 ft. wide? $2\frac{1}{2}$ ft. wide? $3 \times 2 = 6$; $3 \times 2\frac{1}{2} = 7\frac{1}{2}$.

8. How many square feet in a room 12 ft. by 15 ft.? $12 \times 15 = 180$.

9. How many yards of carpet 2 ft. wide will be required to cover the floor of the above room, if the strips run lengthwise of the room?

There will be $12 \div 2 = 6$ strips. $15 \div 3 = 5$ yds. in each strip, and 6×5 yds. = 30 yds. *Ans.*

10. How many square yards in 81 sq. ft.? $81 \div 9 = 9$.

11. How many square rods in $\frac{3}{8}$ of an acre? $\frac{3}{8}$ of $160 = 60$.

12. What part of an acre are 40 sq. rds.? 80? 100? $\frac{1}{4}$; $\frac{1}{2}$; $\frac{5}{8}$.

Ex. 106. Page 167.

1. Reduce 5 A. 147 sq. rds. to square rods.

```
 5 A. 147 sq. rds.
160
800
147
947 sq. rds. Ans.
```

2. How many square inches in 9 sq. yds. 7 sq. ft.?

```
   9 sq. yds. 7 sq. ft.
   9
  81
   7
  88
 144
 352
352
88
12,672 sq. in. Ans.
```

3. Reduce 33,796 sq. in. to square yards.

```
        234
144)33796
    288
     499
     432
      676
      576
      100
```

$\frac{100}{144} = \frac{25}{36}$.

$9)\underline{234\frac{25}{36}}$

$26\frac{25}{324}$

$26\frac{25}{324}$ sq. yds. *Ans.*

4. Reduce 153 A. 87 sq. rds. to square inches.

$$\begin{array}{r l}
153 & \text{A. 87 sq. rds.}\\
160 & \\ \hline
9180 & \\
153 & \\ \hline
24480 & \\
87 & \\ \hline
24567 & \\
272\tfrac{1}{4} & \\ \hline
6141\tfrac{3}{4} & \\
49134 & \\
171969 & \\
49134 & \\ \hline
6688365\tfrac{3}{4} & \\
144 & \\ \hline
108 & \\
26753460 & \\
26753460 & \\
6688365 & \\ \hline
963{,}124{,}668 & \text{sq. in. } \textit{Ans.}
\end{array}$$

5. In 67,413 sq. yds. how many acres?

$$\begin{array}{r|r l}
\multicolumn{2}{r}{30\tfrac{1}{4})\,67413} & \\
\multicolumn{2}{r}{4} & \\ \hline
121 & 269652 & [= 16 \text{ sq. yds.}\\ \cline{2-2}
160 & 2228 & - 64 \text{ quarter sq. yds.}\\ \cline{2-2}
\multicolumn{2}{r}{13} & - 148 \text{ sq. rds.}
\end{array}$$

13 A. 148 sq. rds. 16 sq. yds. *Ans.*

6. In a rectangular field 49 yds. long and 16 yds. wide, how many square feet?

$$\begin{array}{r l}
49 & \text{yds.}\\
16 & \\ \hline
294 & \\
49 & \\ \hline
784 & \text{sq. yds.}\\
9 & \\ \hline
7056 & \text{sq. ft. } \textit{Ans.}
\end{array}$$

7. How many tiles 1 ft. square will be needed to pave a hall 20 ft. long and 9 ft. wide?

$$\begin{array}{r l}
20 & \text{ft.}\\
9 & \\ \hline
180 & \text{sq. ft.}
\end{array}$$

180. *Ans.*

8. How much greater is the area of a lot 50 rods square than that of a lot containing 50 sq. rds.?

$$\begin{array}{r l}
50 & \text{rds.}\\
50 & \\ \hline
2500 & \text{sq. rds.}\\
50 & \\ \hline
2450 & \text{sq. rds. } \textit{Ans.}
\end{array}$$

9. How many square yards in a square lot measuring 142 ft. on a side?

$$\begin{array}{r l}
142 & \text{ft.}\\
142 & \\ \hline
284 & \\
568 & \\
142 & \\ \hline
9)\,20164 & \text{sq. ft.}\\
2240\tfrac{4}{9} & \text{sq. yds. } \textit{Ans.}
\end{array}$$

10. Ingrain carpet is 3 ft. wide. How many yards will be required for a room 27 ft. long and 18 ft. wide?

It will take 9 strips if they run across the room, and 6 strips if they run lengthwise of the room.

18 ft. = 6 yds.,
and 9 × 6 yds. = 54 yds.
Also, 27 ft. = 9 yds.,
and 6 × 9 yds. = 54 yds.

54 yds. *Ans.*

11. From each corner of a square, the side of which is 2 ft. 5 in., a square measuring 5 in. on a side is cut out. Find the area of the remainder of the figure.

2 ft. 5 in. = 29 in.

$$\begin{array}{rlcrl}
 & 29 \text{ in.} & \qquad & 5 & \text{in.}\\
 & \underline{29} & & \underline{5} & \\
 & 261 & & 25 & \text{sq. in.}\\
 & \underline{58} & & \underline{4} & \\
 & 841 \text{ sq. in.} & & 100 & \text{sq. in.}\\
 & \underline{100} & & & \\
144) & 741\,(5 & & & \\
 & \underline{720} & & & \\
 & 21 & & &
\end{array}$$

5 sq. ft. 21 sq. in. *Ans.*

12. Find the value of 0.45 of an acre.

$$\begin{array}{r}
160\\
\underline{0.45}\\
800\\
\underline{64}\\
72.00
\end{array}$$

72.00 sq. rds. *Ans.*

13. Reduce $\frac{17}{24}$ of a square mile to lower denominations.

$\underset{3}{\frac{17}{\cancel{24}}}$ of $\frac{\overset{80}{\cancel{640}}}{1} = \frac{1360}{3} = 453\frac{1}{3}$ A.

$\frac{1}{3}$ of $\frac{160}{1} = \frac{160}{3} = 53\frac{1}{3}$ sq. rds.

$\frac{1}{3}$ of $30\frac{1}{4} = \frac{1}{3}$ of $\frac{121}{4} = \frac{121}{12}$
$= 10\frac{1}{12}$ sq. yds.

$\underset{4}{\frac{1}{\cancel{12}}}$ of $\frac{\overset{3}{\cancel{9}}}{1} = \frac{3}{4}$ sq. ft.

$\frac{3}{\cancel{4}}$ of $\frac{\overset{36}{\cancel{144}}}{1} = 108$ sq. in.

453 A. 53 sq. rds. 10 sq. yds. 108 sq. in. *Ans.*

14. Reduce 80 sq. rds. 2.42 sq. yds. to the decimal of an acre.

$$\begin{array}{rr}
 & 0.08\\
3025) & \overline{242.00}\\
 & \underline{24200}\\
160) & \underline{80.08}\\
 & 0.5005
\end{array}$$

0.5005 *Ans.*

15. Add $\frac{4}{5}$ of an acre, $\frac{5}{9}$ sq. rd., and $\frac{2}{3}$ sq. yd.

$\frac{4}{\cancel{5}}$ of $\frac{\overset{32}{\cancel{160}}}{1} = 128$ sq. rds.

$\frac{5}{9}$ of $30\frac{1}{4} = \frac{5}{9}$ of $\frac{121}{4} = \frac{605}{36} = 16\frac{29}{36}$ sq. yds.

$\frac{29}{36} + \frac{2}{3} = 1\frac{17}{36}$; $16 + 1\frac{17}{36} = 17\frac{17}{36}$ sq. yds.

$\underset{4}{\frac{17}{\cancel{36}}}$ of $\frac{\cancel{9}}{1} = \frac{17}{4} = 4\frac{1}{4}$ sq. ft.

$\frac{1}{\cancel{4}}$ of $\frac{\overset{36}{\cancel{144}}}{1} = 36$ sq. in.

128 sq. rds. 17 sq. yds. 4 sq. ft. 36 sq. in. *Ans.*

16. Add $\frac{2}{3}$ of an acre and $\frac{4}{9}$ of a square rod.

$\frac{2}{3}$ of $\frac{160}{1} = \frac{320}{3} = 106\frac{2}{3}$ sq. rds.
$\frac{2}{3} + \frac{4}{9} = 1\frac{1}{9}$; $106 + 1\frac{1}{9} = 107\frac{1}{9}$ sq. rds.
$\frac{1}{9}$ of $30\frac{1}{4} = \frac{1}{9}$ of $\frac{121}{4} = \frac{121}{36} = 3\frac{13}{36}$ sq. yds.
$\frac{13}{\underset{4}{\cancel{36}}}$ of $\frac{\cancel{9}}{1} = \frac{13}{4} = 3\frac{1}{4}$ sq. ft.
$\frac{1}{\cancel{4}}$ of $\frac{\overset{36}{\cancel{144}}}{1} = 36$ sq. in.
107 sq. rds. 3 sq. yds. 3 sq. ft. 36 sq. in. *Ans.*

17. From $\frac{2}{11}$ of a square rod take $\frac{3}{4}$ of a square yard.

$\frac{2}{11}$ of $30\frac{1}{4} = \frac{\cancel{2}}{\cancel{11}}$ of $\frac{\overset{11}{\cancel{121}}}{\underset{2}{\cancel{4}}} = \frac{11}{2} = 5\frac{1}{2}$ sq. yds.
$5\frac{1}{2} - \frac{3}{4} = 4\frac{3}{4}$ sq. yds.
$\frac{3}{4}$ of $\frac{9}{1} = \frac{27}{4} = 6\frac{3}{4}$ sq. ft.
$\frac{3}{\cancel{4}}$ of $\frac{\overset{36}{\cancel{144}}}{1} = 108$ sq. in.
4 sq. yds. 6 sq. ft. 108 sq. in. *Ans.*

18. Find $\frac{5}{7}$ of 9 A. 70 sq. rds. 15 sq. yds. 7 sq. ft. 19 sq. in.

	A.	sq. rds.	sq. yds.	sq. ft.	sq. in.
	9	70	15	7	19
					5
	47	32	$17\frac{1}{2}$	8	95
			$\frac{1}{2}$	= 4	72
7)	47	32	18	4	23
	6	118	28	5	$13\frac{4}{7}$

6 A. 118 sq. rds. 28 sq. yds. 5 sq. ft. $13\frac{4}{7}$ sq. in. *Ans.*

19. A side of Russell Square in London is 660 ft. How many acres does it contain?

660 ft.	$272\frac{1}{4}$ ft.
660	160
39600	40
396	1632
435600 sq. ft.	272
43560)435600	43560 sq. ft. in 1 A.
10	10. *Ans.*.

20. The area of a rectangular field is 33 sq. rds. 1 sq. yd. 6 sq. ft. 108 sq. in., and the length is 9 rds. 1 ft. 6 in. What is the width?

33 sq. rds. 1 sq. yd. 6 sq. ft. [108 sq. in.
30¼
8¼
990
998¼
1
999¼
9
8993¼
6
8999¼
144
36
35996
35996
8999
1295892
108
1296000 sq. in.

9 rds. 1 ft. 6 in.
16½
148½
1
149½
12
6
1788
1794
6
1800 in.

$18\cancel{0}\cancel{0}\,|\,12960\cancel{0}\cancel{0}$
$12\,|\,720$ in. in width.
60 ft. *Ans.*

21. Find the area of a circular pond if its radius is 300 ft.

300 ft.
300
90,000 sq. ft.

90000 sq. ft.
3.1416
282744 sq. ft. *Ans.*

22. Find the area of the bottom of a round cistern if its diameter is 11 ft.

½ of 11 ft. = 5.5 ft. = radius.

5.5 ft.
5.5
275
275
30.25 sq. ft.

3.1416
30.25
157080
62832
94248
95.033400

95.0334 sq. ft. *Ans.*

23. The radius of the rotunda of the Pantheon of Rome is 71 ft. 6 in. Find the area of the floor in square feet.

71 ft. 6 in. = 71.5 ft.

71.5 ft.
71.5
3575
715
5005
5112.25 sq. ft.

5112.25
3.1416
3067350
511225
2044900
511225
1533675
16060.644600 sq. ft. *Ans.*

24. The two dials of the clock of St. Paul's, London, are each $18\frac{1}{7}$ ft. in diameter. Find the area of each in square feet.

$\frac{1}{2}$ of $18\frac{1}{7}$ ft. $= 9\frac{1}{14}$ ft. $= 9.071$ ft.
$= \text{radius.}$

$$\begin{array}{rl}
9.071 & \text{ft.}\\
\underline{9.071} & \\
9071 & \\
63497 & \\
\underline{81639} & \\
82.283041 & \\
\underline{3.1416} & \\
493698 & \\
82283 & \\
329132 & \\
82283 & \\
\underline{246849} & \\
258.5002728 & \textit{Ans.}
\end{array}$$

25. How many yards of carpet $2\frac{1}{4}$ ft. wide will cover a floor 18 ft. long and 15 ft. wide, if the strips run across the room?

$$\frac{18}{2\frac{1}{4}} = \frac{\overset{2}{\cancel{18}}}{1} \times \frac{4}{\cancel{9}} = 8 \text{ strips.}$$

15 ft. = 5 yds.

8 × 5 yds. = 40 yds. *Ans.*

26. How many yards of carpeting $\frac{3}{4}$ of a yard wide will be required for a floor 26 ft. long, $15\frac{3}{4}$ ft. wide, if the strips run lengthwise? How many if the strips run across the room? How much will be turned under in each case?

$\frac{3}{4}$ yd. $= 2\frac{1}{4}$ ft.

$$\frac{15\frac{3}{4}}{2\frac{1}{4}} = 7 \text{ strips.}$$

7 × 26 ft. = 182 ft. = $60\frac{2}{3}$ yds.

$\frac{3}{4}$ yd. $= 2\frac{1}{4}$ ft.

$$\frac{26}{2\frac{1}{4}} = 11\tfrac{5}{9}, \text{ or 12 strips, } \tfrac{4}{9} \text{ of a strip [turned under.}$$

$$\frac{\cancel{4}}{\underset{3}{\cancel{9}}} \text{ of } \frac{\cancel{3}}{\cancel{4}} \text{ yd.} = \tfrac{1}{3} \text{ yd. turned under.}$$

$15\frac{3}{4}$ ft. $= 5\frac{1}{4}$ yds.

12 × $5\frac{1}{4}$ yds. = 63 yds.

$60\frac{2}{3}$ yds.; 63 yds.; none; $\frac{1}{3}$ yd.
Ans.

27. How many yards of carpeting $\frac{7}{8}$ of a yard wide will be required for a room $8\frac{1}{2}$ yards long and 17 ft. wide, if the strips run lengthwise and there is a waste of $\frac{1}{16}$ of a yard in each strip in matching patterns?

17 ft. = $5\frac{2}{3}$ yds.

$$\frac{5\frac{2}{3}}{\frac{7}{8}} = 6\tfrac{10}{21}, \text{ or 7 strips.}$$

7 × $\frac{1}{16}$ yd. = $\frac{7}{16}$ yd. waste.

7 × $8\frac{1}{2}$ yds. = $59\frac{1}{2}$ yds.

$59\frac{1}{2}$ yds. + $\frac{7}{16}$ yds. = $59\frac{15}{16}$ yds.

60 yds. *Ans.*

28. Find the cost of carpet 30 inches wide at $1.25 per yard, for a room 18 ft. by 14, if the strips run lengthwise. If the strips run across the room.

30 in. = $2\frac{1}{2}$ ft.

$$\frac{14}{2\frac{1}{2}} = 5\tfrac{3}{5}, \text{ or 6 strips.}$$

18 ft. = 6 yds.

6 × 6 yds. = 36 yds.

36 × $1.25 = $45. *Ans.*

$\frac{18}{2\frac{1}{2}} = 7\frac{1}{5}$, or 8 strips.

14 ft. = $4\frac{2}{3}$ yds.

8 × $4\frac{2}{3}$ yds. = $37\frac{1}{3}$ yds.

$37\frac{1}{3}$ × $1.25 = 46.66\frac{2}{3}$. *Ans.*

29. Find the cost of carpeting $\frac{3}{4}$ of a yard wide, at $2.75 per yard, for a room 34 ft. 8 in. by 13 ft. 3 in., if the strips run lengthwise, and if there is a waste of $\frac{1}{4}$ of a yard on each strip in matching the pattern.

$\frac{3}{4}$ yd. = $2\frac{1}{4}$ ft.

3 in. = $\frac{1}{4}$ ft.

$\frac{13\frac{1}{4}}{2\frac{1}{4}} = 5\frac{8}{9}$, or 6 strips.

34 ft. 8 in. = $11\frac{5}{9}$ yds.

6 × $11\frac{5}{9}$ yds. = $69\frac{1}{3}$ yds.

6 × $\frac{1}{4}$ yd. = $1\frac{1}{2}$ yds. waste.

$69\frac{1}{3}$ yds. + $1\frac{1}{2}$ yds. = $70\frac{5}{6}$ yds.

$70\frac{5}{6}$ × $2.75 = $194.79. *Ans.*

30. Which way must the strips of carpet $\frac{3}{4}$ of a yard wide run in order to carpet most economically a room 20 ft. 6 in. long and 19 ft. 6 in. wide, if there is no waste for matching the pattern?

20 ft. 6 in. = $\frac{41}{6}$ yds.

19 ft. 6 in. = $\frac{13}{2}$ yds.

If strips run crosswise, it will take

$$\frac{41}{6} \div \frac{3}{4} = \frac{41}{\underset{3}{\cancel{6}}} \times \frac{\overset{2}{\cancel{4}}}{3} = \frac{82}{9}$$

$= 9\frac{1}{9}$ or 10 strips.

$\frac{13}{\cancel{2}}$ yds. $\times \overset{5}{\cancel{10}} = 65$ yds.

If strips run lengthwise, it will take

$$\frac{13}{2} \div \frac{3}{4} = \frac{13}{\cancel{2}} \times \frac{\overset{2}{\cancel{4}}}{3} = \frac{26}{3}$$

$= 8\frac{2}{3}$ or 9 strips.

$\frac{41}{\underset{2}{\cancel{6}}}$ yds. $\times \overset{3}{\cancel{9}} = \frac{123}{2} = 61\frac{1}{2}$ yds.

65 yds. − $61\frac{1}{2}$ yds. = $3\frac{1}{2}$ yds. less, if strips run lengthwise. *Ans.*

31. How many yards of plastering in the four walls of a room 14 ft. 3 in. long, 13 ft. 4 in. wide, and 7 ft. high, if no allowance is made for doors and windows?

$$\begin{array}{l} 14\frac{1}{4} \\ 14\frac{1}{4} \end{array}\Big\}\text{ side walls.}$$

$$\begin{array}{l} 13\frac{1}{3} \\ \underline{13\frac{1}{3}} \end{array}\Big\}\text{ end walls.}$$

$$\begin{array}{r} 55\frac{1}{6}\text{ circuit.} \\ \underline{7\phantom{\frac{1}{6}}} \\ 9)\underline{386\frac{1}{6}}\text{ area in feet.} \\ 42\text{–}8\frac{1}{6} \end{array}$$

42 sq. yds. 8 sq. ft. 24 sq. in. *Ans.*

32. Find the yards of plastering in the walls of a room $21\frac{3}{4}$ ft. long,

$16\frac{1}{2}$ ft. wide, and 11 ft. high, if 12 sq. yds. be allowed for doors, windows, and base-boards.

$\left.\begin{array}{r}21\frac{3}{4}\\21\frac{3}{4}\end{array}\right\}$ side walls.
$\left.\begin{array}{r}16\frac{1}{2}\\16\frac{1}{2}\end{array}\right\}$ end walls.
$76\frac{1}{2}$ circuit.
11
$5\frac{1}{2}$
76
76
$9\overline{)841\frac{1}{2}}$ area in feet.
$93\frac{1}{2}$ sq. yds.
12
$81\frac{1}{2}$ sq. yds. *Ans.*

33. How many square yards of plastering in the walls and ceiling of a room 30 ft. 8 in. long, 26 ft. 5 in. wide, 10 ft. 6 in. high, if 24 sq. yds. be allowed for doors, windows, and base-boards?

$\left.\begin{array}{r}30\frac{2}{3}\\30\frac{2}{3}\end{array}\right\}$ side walls.
$\left.\begin{array}{r}26\frac{5}{12}\\26\frac{5}{12}\end{array}\right\}$ end walls.
$114\frac{1}{6}$ circuit.
$10\frac{1}{2}$
$1198\frac{3}{4}$ area in feet.
$30\frac{2}{3} \times 26\frac{5}{12} = 810\frac{1}{9}$ area of ceiling.
$9\overline{)2008\frac{31}{36}}$ sq. ft.
$223\frac{67}{324}$ sq. yds.
24
$199\frac{67}{324}$ sq. yds.

$199\frac{1}{4}$ sq. yds, nearly. *Ans.*

34. What will be the cost of plastering the walls and ceiling of a room 27 ft. 4 in. long, 20 ft. wide, and 12 ft. 6 in. high, at 27 cents per square yard, if 20 sq. yds. be deducted for doors, windows, and base-boards?

$\left.\begin{array}{r}27\frac{1}{3}\\27\frac{1}{3}\end{array}\right\}$ side walls.
$\left.\begin{array}{r}20\\20\end{array}\right\}$ end walls.
$94\frac{2}{3}$ circuit.
$12\frac{1}{2}$
$47\frac{1}{3}$
1136
$1183\frac{1}{3}$ area in feet.
$27\frac{1}{3} \times 20 = 546\frac{2}{3}$ area of ceiling.
$9\overline{)1730}$ sq. ft.
$192\frac{2}{9}$ sq. yds.
20
$172\frac{2}{9}$ sq. yds.
0.27
6
1204
344
46.50
$46.50. *Ans.*

35. Find the cost of whitening the ceiling and walls of a room 14 ft. 4 in. wide, 15 ft. 6 in. long, and 10 ft. 6 in. high, at 5 cents per square yard, allowing 9 sq. yds. for doors and windows.

$$\left.\begin{matrix}14\frac{1}{3}\\14\frac{1}{3}\end{matrix}\right\}\text{end walls.}$$
$$\left.\begin{matrix}15\frac{1}{2}\\15\frac{1}{2}\end{matrix}\right\}\text{side walls.}$$

$59\frac{2}{3}$ circuit.
$10\frac{1}{2}$
$626\frac{1}{2}$ area in feet.
$15\frac{1}{2} \times 14\frac{1}{3} = 222\frac{1}{6}$ area of ceiling.
$9\overline{)848\frac{2}{3}}$ sq. ft.
$94\frac{8}{27}$ sq. yds.
9
$85\frac{8}{27}$ sq. ft.
0.05
4.26
$4.26. *Ans.*

36. Find the cost of papering a room 32 ft. long, 22 ft. wide, 13 ft. high, with paper 18 in. wide, 8 yds. in a roll, at $1.25 a roll, if 50 sq. yds. be allowed for doors, windows, and base-boards.

$$\left.\begin{matrix}32\\32\end{matrix}\right\}\text{side walls.}$$
$$\left.\begin{matrix}22\\22\end{matrix}\right\}\text{end walls.}$$

108 circuit.
13
$9\overline{)1404}$ area in feet.
156 sq. yds.
50
106 sq. yds.
18 in. = $\frac{1}{2}$ yd.
$8 \times \frac{1}{2}$ yd. = 4 sq. yds. in 1 roll.
$106 \div 4 = 26\frac{1}{2}$, or 27 rolls.
27 × $1.25 = $33.75.
$33.75. *Ans.*

Ex. 107. (*Oral.*) Page 171.

1. How many chains make a mile? 320 rds. ÷ 4 rds. = 80. *Ans.*

2. In 10 mi. how many chains? 10 × 80 chs. = 800 chs. *Ans.*

3. How many rods in 9 chains? 9 × 4 rds. = 36 rds. *Ans.*

4. How many yards in 1 chain? how many feet?

$4 \times 5\frac{1}{2}$ yds. = 22 yds. *Ans.* 22 × 3 ft. = 66 ft. *Ans.*

5. How many chains in 48 rods? 48 ÷ 4 = 12. *Ans.*

6. In 0.75 of a mile how many chains?

$0.75 = \frac{3}{4}$; $\frac{3}{4}$ of 80 chs. = 60 chs. *Ans.*

7. How many chains in $\frac{3}{8}$ of a mile? $\frac{3}{8}$ of 80 chs. = 30 chs. *Ans.*

8. If a square field measures 1 chain on a side, how many square rods does it contain? How many square rods then in a square chain?

4 × 4 = 16. *Ans.* 16 sq. rds. *Ans.*

9. If a square chain contains 16 sq. rds., how many square chains make an acre? 160 ÷ 16 = 10. *Ans.*

10. What part of an acre are 4 sq. chains? 5 sq. chains? 8 sq. chains?

$\frac{4}{10}=\frac{2}{5}$; $\frac{5}{10}=\frac{1}{2}$; $\frac{8}{10}=\frac{4}{5}$. *Ans.*

11. What part of a chain are 50 links? 25 links? 20 links?

$\frac{1}{2}$; $\frac{1}{4}$; $\frac{1}{5}$. *Ans.*

12. How many square rods in a square garden-plot measuring 75 links on a side? 75 links = 3 rds.; (3 × 3) sq. rds. = 9 sq. rds. *Ans.*

13. How many inches long is a link?

25 links = 1 rd.; 1 rd. = 198 in.; 198 ÷ 25 = $7\frac{23}{25}$. *Ans.*

14. The distance between two places is found to be 320 chains. Express the distance in miles. 320 ÷ 80 = 4. *Ans.*

Ex. 108. Page 172.

1. Reduce 38 chains 80 links to the decimal of a mile.

38.8 chs.
4
320)155.2 rds.
0.485 mi. *Ans.*

2. The four sides of a field are 23 chains 19 links, 17 chains 34 links, 6 chains 85 links, and 24 chains 62 links. How many yards around the field?

23.19 chs.
17.34
6.85
24.62
72.00 chs.
4
288 rds.
$5\frac{1}{2}$
1584 yds. *Ans.*

3. One field contains 3 sq. chains, and another is 3 chains square. How many acres in both fields together?

3 sq. chs. + 9 sq. chs. = 12 sq. chs.
10)12 sq. chs.
$1\frac{1}{5}$ A. *Ans.*

4. A field is crossed by a driveway 15 links wide and 13 chains 43 links long. How many square rods in the driveway?

13.43
0.15
2.0145 sq. chs.
16
32.232 sq. rds. *Ans.*

5. From a field of 4 A. a rectangular piece 3 chains 25 links long and 2 chains 75 links wide is reserved. How much of the field is left?

3.25
2.75
8.9375

$$\begin{array}{r} 4. \\ \underline{0.89375} \\ 3.10625 \text{ A.} \\ \underline{16} \\ 17.00000 \text{ sq. rds.} \end{array}$$

3 A. 17 sq. rds. *Ans.*

6. The sides of a triangular field measure 21½ chains, 14 chains 11 links, and 8 chains 10 links respectively. By how many yards is the longest side less than the sum of the other two?

$$\begin{array}{r} 14.11 \text{ chs.} \\ \underline{8.10} \\ 22.21 \\ \underline{21.50} \\ 0.71 \text{ ch.} \\ \underline{22} \\ 15.62 \text{ yds. } \textit{Ans.} \end{array}$$

Ex. 109. Page 173.

1. How many feet board measure in a board 18 ft. long, 6 in. wide, ⅞ in. thick?

6 in. = ½ ft. ½ of 18 ft. = 9 ft. *Ans.*

2. How many feet board measure in a board 16 ft. long, 12 in. wide, 1 in. thick?

12 in. = 1 ft. 1 × 16 ft. = 16 ft. *Ans.*

3. How many feet board measure in forty boards 14 ft. long, 10 in. wide, ½ in. thick?

10 in. = ⅚ ft.

$$\frac{\overset{7}{\cancel{14}}}{1}\times\frac{5}{\underset{3}{\cancel{6}}}\times\frac{40}{1}=\frac{1400}{3}=466\tfrac{2}{3}.$$

466⅔ ft. *Ans.*

4. How many feet board measure in a stick of square timber 8 in. by 9 in., and 30 ft. long?

$$\frac{\overset{2}{\cancel{8}}}{1}\times\frac{9}{\underset{\cancel{3}}{\cancel{12}}}\times\frac{\overset{10}{\cancel{30}}}{1}=180.$$

180 ft. *Ans.*

5. How many feet board measure in six joists, each 3 in. by 4 in., and 11 ft. long?

$$6\times\cancel{3}\times\frac{\cancel{4}}{\underset{\cancel{3}}{\cancel{12}}}\times 11=66.$$

66 ft. *Ans.*

6. How many feet board measure in ten joists, each 6 in. by 4 in., and 14 ft. long?

$$10 \times \overset{2}{\cancel{6}} \times \frac{\cancel{4}}{\underset{\cancel{3}}{\cancel{12}}} \times 14 = 280. \qquad 280 \text{ ft. } \textit{Ans.}$$

7. How many feet board measure in a stick of square timber 10 in. by 12 in., and 36 ft. long?

$$10 \times \frac{\cancel{12}}{\cancel{12}} \times 36 = 360. \qquad 360 \text{ ft. } \textit{Ans.}$$

8. How many feet board measure in ten 2-in. planks, each 13 ft. long, 15 in. wide?

$$\overset{5}{\cancel{10}} \times \cancel{2} \times 13 \times \frac{\overset{5}{\cancel{15}}}{\underset{\underset{\cancel{2}}{\cancel{6}}}{\cancel{12}}} = 325. \qquad 325 \text{ ft. } \textit{Ans.}$$

9. How many feet board measure in thirty 3-in. planks, each 12 ft. long, 10 in. wide?

$$30 \times 3 \times \cancel{12} \times \frac{10}{\cancel{12}} = 900. \qquad 900 \text{ ft. } \textit{Ans.}$$

10. How many feet board measure in a board 24 ft. long, 23 in. wide at one end and 17 in. at the other, and $1\frac{1}{2}$ in. thick?

$$\frac{23+17}{2} \text{ in.} = 20 \text{ in.} \qquad \overset{\cancel{2}}{\cancel{24}} \times \frac{3}{\cancel{2}} \times \frac{20}{\cancel{12}} = 60. \qquad 60 \text{ ft. } \textit{Ans.}$$

11. How many feet board measure in a stick of timber 40 ft. long and 15 in. square?

$$15 \times \frac{\overset{5}{\cancel{15}}}{\underset{\cancel{4}}{\cancel{12}}} \times \overset{10}{\cancel{40}} = 750. \qquad 750 \text{ ft. } \textit{Ans.}$$

12. How many feet board measure in ten 4-in. planks 16 ft. long and 10 in. wide?

$$10 \times 4 \times \overset{8}{\cancel{16}} \times \frac{\overset{\cancel{5}}{\cancel{10}}}{\underset{\underset{3}{\cancel{6}}}{\cancel{12}}} = \frac{1600}{3} = 533\tfrac{1}{3}. \qquad 533\tfrac{1}{3} \text{ ft. } \textit{Ans.}$$

Ex. 110. (*Oral.*) Page 175.

1. A brick is 2 by 4 by 8 in. Find its volume.

$2 \times 4 \times 8 = 64$ cu. in. *Ans.*

2. How many cubic feet in 2 cu. yds.?

$2 \times 27 = 54$. *Ans.*

3. How many cubic yards in 81 cu. ft.?

$81 \div 27 = 3$. *Ans.*

4. Twelve cubic feet are what part of a cubic yard?

$\frac{12}{27} = \frac{4}{9}$. *Ans.*

5. How many cords in 40 cd. ft.? in 16 cd. ft.

$40 \div 8 = 5$; $16 \div 8 = 2$. *Ans.*

6. How many cords in a pile of wood 32 ft. long, 4 ft. wide, and 4 ft. high? $32 \div 8 = 4$. *Ans.*

7. How many loads of earth, each 1 cu. yd., must be removed in digging a ditch 21 ft. long, 3 ft. wide, and 3 ft. deep?

$21 \times 3 \times 3 = 189$; $189 \div 27 = 7$. *Ans.*

8. How many cubic feet in a stick of timber 12 in. wide, 9 in. thick, and 24 ft. long?

12 in. = 1 ft.; 9 in. = $\frac{3}{4}$ ft.; $\overset{6}{\cancel{24}} \times 1 \times \frac{3}{\cancel{4}} = 18$. *Ans.*

9. How many feet board measure in a cubic foot?

A cubic foot is equivalent to 12 boards, each 1 inch in thickness and 1 foot square. Hence the number of feet board measure in 1 cubic foot is 12. *Ans.*

10. How many cubic feet in a stick of timber 16 in. wide, 9 in. thick, and 21 ft. long?

16 in. = $1\frac{1}{3}$ ft.; 9 in. = $\frac{3}{4}$ ft. $21 \times \frac{\cancel{4}}{\cancel{3}} \times \frac{\cancel{3}}{\cancel{4}} = 21$ cu. ft. *Ans.*

Ex. 111. Page 175.

1. Reduce 15 cu. yds. 13 cu. ft. to cubic inches.

15 cu. yds. 13 cu. ft.
27
105
30
405
13
418 cu. ft.
1728
3344
836
2926
418
722,304 cu. in. *Ans.*

2. Reduce 150,000 cu. in. to cubic yards.

86
1728)150000 cu. in.
13824
11760
10368
1392 cu. in.

27)86(3
81
5

3 cu. yds. 5 cu. ft. 1392 cu. in. *Ans.*

3. Subtract 28 cu. yds. 25 cu. ft. 1500 cu. in. from 47 cu. yds. 13 cu. ft. 1236 cu. in.

cu. yds.	cu. ft.	cu. in.
47	13	1236
28	25	1500
18	14	1464

18 cu. yds. 14 cu. ft. 1464 cu. in. *Ans.*

4. Multiply 17 cu. yds. 17 cu. ft. 187 cu. in. by 11.

cu. yds.	cu. ft.	cu. in.
17	17	187
		11
193	26	329

11 × 187 cu. in. = 2057 cu. in.
= 1 cu. ft. 329 cu. in.
11 × 17 cu. ft. = 187 cu. ft.
187 + 1 = 188 cu. ft.
= 6 cu. yds. 26 cu. ft.
11 × 17 cu. yds. = 187 cu. yds.
187 + 6 = 193 cu. yds.
193 cu. yds. 26 cu. ft. 329 cu. in. *Ans.*

5. Divide 22 cu. yds. 10 cu. ft. 933 cu. in. by 7.

cu. yds.	cu. ft.	cu. in.
7)22	10	933
3	5	627

22 cu. yds. ÷ 7 = 3 and 1 cu. yd. over.
1 cu. yd. = 27 cu. ft.
27 + 10 = 37 cu. ft.
37 cu. ft. ÷ 7 = 5 and 2 cu. ft. over.
2 cu. ft. = 3456 cu. in.
3456 + 933 = 4389 cu. in.
4389 ÷ 7 = 627 cu. in.
3 cu. yds. 5 cu. ft. 627 cu. in. *Ans.*

6. How many cubic inches can be cut out of a cubic foot?

12 × 12 × 12 = 1728 cu. in. *Ans.*

7. How many cubic feet of water will a cistern hold whose three dimensions are each 4 ft.?

4 × 4 × 4 = 64.
64 cu. ft. *Ans.*

8. How many cubic inches in a rectangular stone post 3 ft. high, 1 ft. wide, and 1 ft. thick?

$3 \times 1 \times 1 = 3.$

3 cu. ft. $= 3 \times 1728 = 5184$ cu. in. *Ans.*

9. Find the value of 0.975 of a cubic yard.

$$\begin{array}{r l}
0.975 & \text{cu. yd.} \\
\underline{27} & \\
6825 & \\
\underline{1950} & \\
26.325 & \text{cu. ft.} \\
\underline{1728} & \\
2600 & \\
650 & \\
2275 & \\
\underline{325} & \\
561.600 & \text{cu. in.}
\end{array}$$

26 cu. ft. 561.6 cu. in. *Ans.*

10. Reduce 13 cu. ft. 864 cu. in. to the decimal of a cubic yard.

$$\begin{array}{r l}
\underline{0.5} & \text{cu. ft.} \\
1728)864.0 & \text{cu. in.} \\
\underline{8640} &
\end{array}$$

$$\begin{array}{r l}
\underline{0.5} & \text{cu. yd.} \\
27)13.5 & \text{cu. ft.} \\
\underline{135} &
\end{array}$$

0.5 cu. yd. *Ans.*

11. A man bought 52 cu. yds. 18 cu. ft. 984 cu. in. of stone for the cellar of a house, and $\frac{3}{4}$ as much for the cellar of a second house. How much did he buy for both?

The cellar for the first house was $\frac{4}{4}$, and for the second $\frac{3}{4}$; hence both together were $\frac{7}{4}$ of 52 cu. yds. 18 cu. ft. 984 cu. in.

$$\begin{array}{r r r}
\text{cu. yds.} & \text{cu. ft.} & \text{cu. in.} \\
4)\underline{52} & \underline{18} & \underline{984} \\
13 & 4 & 1110 \\
 & & \underline{7} \\
92 & 5 & 858
\end{array}$$

92 cu. yds. 5 cu. ft. 858 cu. in. *Ans.*

12. How many cords of wood in a pile 50 ft. long, 6 ft. high, and 4 ft. wide?

$50 \times 6 \times 4 = 1200$ cu. ft.

1 cord $= 8 \times 16$ cu. ft. $= 128$ cu. ft.

$1200 \div 128 = 9\frac{3}{8}$. $9\frac{3}{8}$ cords. *Ans.*

13. How many cords of wood in a pile 42 ft. long, $6\frac{1}{2}$ ft. high, and 8 ft. wide?

$$\begin{array}{r l}
42 & \\
\underline{6\frac{1}{2}} & \\
21 & \\
\underline{252} & \\
273 & \\
\underline{8} & \\
128)2184 & \text{cu. ft.}(17 \\
\underline{128} & \\
904 & \\
\underline{896} & \\
\frac{8}{128} = \frac{1}{16}. &
\end{array}$$

$17\frac{1}{16}$ cords. *Ans.*

14. What must be the length of a load of wood that is 4 ft. wide, $5\frac{1}{3}$ ft. high, to contain 2 cds.?

$4 \times 5\frac{1}{3} = 21\frac{1}{3}$ sq. ft.

2 cords $= 256$ cu. ft.

$$256 \div 21\frac{1}{3} = \overset{4}{\cancel{256}} \times \frac{3}{\cancel{64}} = 12.$$

12 ft. *Ans.*

15. A cubic foot of wood weighs 20 pounds. Find the weight of 10 boards, each 30 ft. long, 1 ft. wide, and 1 in. thick.

$$\overset{5}{\cancel{30}} \times 1 \times \frac{1}{\underset{2}{\cancel{12}}} \times \overset{5}{\cancel{10}} = 25.$$

$25 \times 20 = 500$. 500 lbs. *Ans.*

Ex. 112. (*Oral.*) Page 177.

1. How many pints in 16 gi.? in 37 gi.?
$16 \div 4 = 4$. *Ans.* $37 \div 4 = 9\frac{1}{4}$. *Ans.*

2. How many pints in 2 qts.? in 7 qts. 1 pt.?
$2 \times 2 = 4$. *Ans.* $7 \times 2 = 14$; $14 + 1 = 15$. *Ans.*

3. How many quarts in 2 pks.? in 3 pks. 3 qts.?
$2 \times 8 = 16$. *Ans.* $3 \times 8 = 24$; $24 + 3 = 27$. *Ans.*

4. How many quarts in 3 bu.? $3 \times 4 \times 8 = 96$. *Ans.*

5. How many baskets holding $2\frac{1}{2}$ pks. each will 10 bu. of apples fill?
10 bu. = 40 pks.; $40 \div 2\frac{1}{2} = 16$. *Ans.*

6. If a pint of milk cost 4 cts., what will a gallon cost?
1 gal. = 8 pints; 8×4 cts. = 32 cts. *Ans.*

7. How many times will a gallon of water fill a half-pint cup?
8 pints = 1 gal.; $8 \div \frac{1}{2} = 16$. *Ans.*

8. How many pint bottles will be required to hold 5 gals. 2 qts. of cider? 5 gals. = 40 pints; 2 qts. = 4 pints; $40 + 4 = 44$. *Ans.*

9. If 4 qts. of blueberries cost 32 cts., what will a bushel cost at the same rate? $\frac{32}{4} = 8$; and 8×32 cts. = \$2.56. *Ans.*

10. A 2-gal. measure of molasses lacks 3 pts. of being full. What is the molasses worth at 80 cts. a gallon?
3 pts. = $\frac{3}{8}$ gal., and $2 - \frac{3}{8} = 1\frac{5}{8}$. $1\frac{5}{8} \times 80$ cts. = \$1.30. *Ans*

11. If a horse eats 4 qts. of corn a day, how many days will a bushel last him? $32 \div 4 = 8$. *Ans.*

12. If a quart of berries is worth 10 cts., what is a peck worth?
8×10 cts. = 80 cts. *Ans.*

Ex. 113. Page 177.

1. Reduce 440 pts. to pecks, and 109 pts. to gallons.

2 | 440 pts.
8 | 220 qts.
27 pks. 4 qts.

27 pks. 4 qts. *Ans.*

2 | 109 pts.
4 | 54 qts. 1 pt.
13 gals. 2 qts.

13 gals. 2 qts. 1 pt. *Ans.*

2. Reduce 2024 pts. to bushels.

2 | 2024 pts.
8 | 1012 qts.
4 | 126 pks. 4 qts.
31 bu. 2 pks.

31 bu. 2 pks. 4 qts. *Ans.*

Add:

3.

gals.	qts.	pts.
13	2	1
2	3	0
15	0	0
7	1	1
38	4)7	2)2
	1 gal. 3 qts.	1 qt. 0 pt.

38 gals. 3 qts. *Ans.*

4.

bu.	pks.	qts.
5	1	3
6	1	1
2	0	0
3	0	2
16	2	6

16 bu. 2 pks. 6 qts. *Ans.*

5.

bu.	pks.	qts.
17	2	4
11	3	4
3	0	0
18	3	4
51	4)9	8)12
	2 bu. 1 pk.	1 pk. 4 qts.

51 bu. 1 pk. 4 qts. *Ans.*

Subtract:

6.

gals.	qts.	pts.
4	1	0
3	2	1
	2	1

2 qts. 1 pt. *Ans.*

7.

bu.	pks.	qts.
56	1	0
27	3	0
28	2	0

28 bu. 2 pks. *Ans.*

8.

bu.	pks.	qts.
27	1	1
18	1	3
8	3	6

8 bu. 3 pks. 6 qts. *Ans.*

9. Multiply 15 gals. 2 qts. 1 pt by $130\frac{3}{5}$.

gals.	qts.	pts.
15	2	1
		$130\frac{3}{5}$
2040	$2\frac{1}{5}$	$\frac{3}{5}$
	$\frac{1}{5}$	$= \frac{2}{5}$
2040	2	1

2040 gal. 2 qts. 1 pt. *Ans.*

10. Divide 34 bu. 3 pks. 4 qts. by 9.

$$\begin{array}{r|rrr} & \text{bu.} & \text{pks.} & \text{qts.} \\ 9) & 34 & 3 & 4 \\ \hline & 3 & 3 & 4 \end{array}$$

3 bu. 3 pks. 4 qts. *Ans.*

11. How many pint bottles will be required to hold 63 gals. of wine?

$$\begin{array}{r l} 63 & \text{gals.} \\ 4 & \\ \hline 252 & \text{qts.} \\ 2 & \\ \hline 504 & \text{pts.} \quad 504. \ \textit{Ans.} \end{array}$$

12. How many pint packages can a seedsman make from 3 bu. 3 pks. 6 qts. of peas?

$$\begin{array}{r l} 3 & \text{bu. 3 pks. 6 qts.} \\ 4 & \\ \hline 12 & \\ 3 & \\ \hline 15 & \text{pks.} \\ 8 & \\ \hline 120 & \\ 6 & \\ \hline 126 & \text{qts.} \\ 2 & \\ \hline 252 & \text{pts.} \quad 252. \ \textit{Ans.} \end{array}$$

13. In one season a market-gardener sold 3758 baskets of strawberries averaging 1 pt. each. How many bushels did he sell?

$$\begin{array}{r|l} 2 & 3758 \text{ pts.} \\ 8 & 1879 \text{ qts.} \\ 4 & 234 \text{ pks. 7 qts.} \\ & 58 \text{ bu. 2 pks.} \end{array}$$

58 bu. 2 pks. 7 qts. *Ans.*

14. A farmer having a flock of 87 fowls feeds them daily 2 bu. 1 pk. 1 pt. of grain. What is the average amount for each fowl?

$$\begin{array}{r r l} & 2 & \text{bu. 1 pk. 1 pt.} \\ & 4 & \\ \hline & 8 & \\ & 1 & \\ \hline & 9 & \text{pks.} \\ & 8 & \\ \hline & 72 & \text{qts.} \\ & 2 & \\ \hline & 144 & \\ & 1 & \\ \hline 87) & 145 & \text{pts.}(1 \\ & 87 & \\ \hline & \frac{58}{87} & = \frac{2}{3} \end{array}$$

$1\frac{2}{3}$ pts. *Ans.*

15. A lady in one month gave to her 4 canaries $\frac{3}{4}$ of a quart of seed, to her parrot $2\frac{1}{3}$ qts., and to 3 mocking-birds $1\frac{4}{5}$ qts. How much seed did she give to all the birds together?

$\frac{3}{4} + 2\frac{1}{3} + 1\frac{4}{5} = 4\frac{53}{60}$ qts.

$\frac{53}{60}$ qts. $\times 2 = 1\frac{23}{30}$ pts.

4 qts. $1\frac{23}{30}$ pts. *Ans.*

16. A gardener raised $\frac{4}{5}$ of a bushel of Lima beans, and $\frac{7}{8}$ of a bushel of caseknife beans. He sold 3 pks. 6 qts. 1 pt.; how many had he left?

$\frac{4}{5} + \frac{7}{8} = \frac{67}{40} = 1\frac{27}{40}$ bu.

$$\frac{27}{\underset{10}{\cancel{40}}} \times \cancel{4} \text{ pks.} = 2\frac{7}{10} \text{ pks.}$$

$$\frac{7}{\cancel{10}} \times \overset{4}{\cancel{8}}\text{ qts.} = 5\tfrac{3}{5}\text{ qts.}$$

$\frac{3}{5} \times 2$ pts. $= 1\frac{1}{5}$ pts.

bu.	pks.	qts.	pts.
1	2	5	$1\frac{1}{5}$
	3	6	1
	2	7	$\frac{1}{5}$

2 pks. 7 qts. $\frac{1}{5}$ pt. *Ans.*

17. A merchant receivos 37 boxes of oranges, amounting to 25 bu. 3 pks. 7 qts. Only $\frac{5}{7}$ of the fruit was fit to sell; how many bushels had to be thrown away?

If $\frac{5}{7}$ was fit to sell, then $\frac{2}{7}$ was thrown away.

	bu.	pks.	qts.
7)	25	3	7
	3	2	$6\frac{5}{7}$
			2
	7	1	$6\frac{3}{7}$

7 bu. 1 pk. $5\frac{3}{7}$ qts *Ans.*

18. A tank is 30 ft. 3 in. long, 16 ft. 4 in. wide, and 6 ft. 4 in. deep. Find how many gallons it will hold.

30 ft. 3 in. = 363 in.
16 ft. 4 in. = 196 in.
6 ft. 4 in. = 76 in.

$$\frac{\overset{\overset{11}{\cancel{121}}}{\cancel{363}} \times \overset{28}{\cancel{196}} \times 76}{\underset{\underset{\cancel{7}}{\cancel{77}}}{\cancel{231}}} = 23408.$$

23,408 gals. *Ans.*

19. Find the number of bushels in a bin that is 6 ft. long, 5 ft. wide, 4 ft. deep.

6 ft. = 72 in.
5 ft. = 60 in.
4 ft. = 48 in.

$$\frac{72 \times \overset{30}{\cancel{60}} \times 48}{\underset{1075.21}{\cancel{2150.42}}} = \frac{103680}{1075.21} = 96.4.$$

96.4 bu. *Ans.*

20. How many gallons will a cistern hold that is 5 ft. square and 6 ft. deep?

5 ft. = 60 in.
6 ft. = 72 in.

$$\frac{60 \times 60 \times \overset{24}{\cancel{72}}}{\underset{77}{\cancel{231}}} = 1122\tfrac{6}{77}.$$

$1122\frac{6}{77}$ gals. *Ans.*

Ex. 114. (*Oral.*) Page 179.

1. How many ounces in 2 lbs.? in 5 lbs.?
$2 \times 16 = 32$; $5 \times 16 = 80$. *Ans.*

2. How many ounces in $\frac{1}{4}$ of a pound? in $\frac{3}{4}$ of a pound? in $\frac{1}{8}$ of a pound? in $\frac{5}{8}$ of a pound? in $\frac{7}{8}$ of a pound?
$16 \div 4 = 4$; $\frac{3}{4}$ of $16 = 12$; $\frac{1}{8}$ of $16 = 2$;
$\frac{5}{8}$ of $16 = 10$; $\frac{7}{8}$ of $16 = 14$. *Ans.*

3. What part of a pound are 4 oz.? 2 oz.? 8 oz.? 6 oz.? 12 oz.?

$\frac{4}{16}=\frac{1}{4}$; $\frac{2}{16}=\frac{1}{8}$; $\frac{8}{16}=\frac{1}{2}$; $\frac{6}{16}=\frac{3}{8}$; $\frac{12}{16}=\frac{3}{4}$. *Ans.*

4. How many pounds in 48 oz.? in 36 oz.? in 24 oz.?

$48 \div 16 = 3$; $36 \div 16 = 2\frac{1}{4}$; $24 \div 16 = 1\frac{1}{2}$. *Ans.*

5. How many hundred-weight in 2 t.? in 3 t.?

$2 \times 20 = 40$; $3 \times 20 = 60$. *Ans.*

6. How many 4-oz. packages of nutmegs can be put up from $2\frac{1}{4}$ lbs. of nutmegs?

$2\frac{1}{4} \times 16$ oz. = 36 oz. $36 \div 4 = 9$. *Ans.*

7. If hay is $20 a ton, how many pounds can be bought for $5? $7? $10?

$\frac{5}{20}=\frac{1}{4}$, $\frac{1}{4}$ of $2000 = 500$; $\frac{7}{20}$ of $2000 = 700$;
$\frac{10}{20}=\frac{1}{2}$, $\frac{1}{2}$ of $2000 = 1000$. *Ans.*

8. If hay is $16 a ton, what are 750 lbs. worth?

$\frac{750}{2000}=\frac{3}{8}$; $\frac{3}{8}$ of \$16 = \$6. *Ans.*

9. What part of a pound is $\frac{4}{5}$ of an ounce?

1 ounce = $\frac{1}{16}$ of a pound. $\frac{\cancel{4}}{5}$ of $\frac{1}{\underset{4}{\cancel{16}}} = \frac{1}{20}$. *Ans.*

10. If butter is 25 cts. a pound, and hay is $16 a ton, how many pounds of butter will it take to pay for 1500 lbs. of hay?

$\frac{1500}{2000}=\frac{3}{4}$; $\frac{3}{4}$ of \$16 = \$12; \$12 ÷ \$0.25 = 48. *Ans.*

Ex. 115. Page 180.

1. Reduce 12,484 oz. to higher denominations.

16)12484 oz.
780 lbs. 4 oz.

7 cwt. 80 lbs. 4 oz. *Ans.*

2. Reduce 7 cwt. 64 lbs. to ounces.

7 cwt. 64 lbs.
100
700
64
764 lbs.
16
12224 oz. *Ans.*

3. Reduce 95,784 oz. to higher denominations.

$$\begin{array}{r|l} 16 & \underline{95784}\text{ oz.} \\ 100 & \underline{\ \ 5986}\text{ lbs. 8 oz.} \\ 20 & \underline{\ \ \ \ \ 59}\text{ cwt. 86 lbs.} \\ & \ \ \ \ \ \ \ 2\text{ t. 19 cwt.} \end{array}$$

2 t. 19 cwt. 86 lbs. 8 oz. *Ans.*

4. A bushel of wheat weighs 60 lbs. How many bushels in $1\frac{1}{2}$ t.?

$$\begin{array}{r} 1\frac{1}{2}\text{ t.} \\ \underline{2000} \\ 6\cancel{0})\underline{300\cancel{0}}\text{ lbs.} \\ 50 \end{array}$$

50 bu. *Ans.*

5. A cubic foot of water weighs 1000 oz. In 1800 cu. ft. of water how many tons?

$$\begin{array}{r|r} & 1800 \\ & 1000 \\ 16 & \underline{1800000}\text{ oz.} \\ 2\cancel{0}\cancel{0}\cancel{0} & \underline{112\cancel{5}\cancel{0}\cancel{0}} \\ & 56\frac{1}{4}\text{ t.} \end{array}$$

$56\frac{1}{4}$ t. *Ans.*

6. What is the difference in pounds between 27 long tons of coal and 27 short tons of coal?

$$\begin{array}{r} 2240\text{ lbs.} \\ \underline{2000} \\ 240\text{ lbs.} \\ \underline{27} \\ 6480\text{ lbs.} \end{array}$$

6480 lbs. *Ans.*

7. Find the value of $\frac{4}{15}$ of a ton.

$\frac{4}{15}$ of 20 cwt. = $5\frac{1}{3}$ cwt.
$\frac{1}{3}$ of 100 lbs. = $33\frac{1}{3}$ lbs.
$\frac{1}{3}$ of 16 oz. = $5\frac{1}{3}$ oz.

5 cwt. 33 lbs. $5\frac{1}{3}$ oz. *Ans.*

8. What fraction of a pound is 0.00006 of a ton?

$$\begin{array}{r} 0.00006\text{ t.} \\ \underline{2000} \\ 0.12\text{ lb.} \end{array}$$

0.12 lb. *Ans.*

9. Add $\frac{4}{5}$ t., $\frac{1}{4}$ cwt., $\frac{3}{4}$ lb.

$\frac{4}{5}$ of 2000 lbs. = 1600 lbs.
$\frac{1}{4}$ of 100 lbs. = 25 lbs.
$\frac{3}{4}$ lb. = $\frac{3}{4}$ lb.

$1625\frac{3}{4}$ lbs. *Ans.*

10. Reduce 8 cwt. 34 lbs. to the decimal of a ton.

$$2000)\underline{834.0}\text{ lbs.}$$

0.417 t. *Ans.*

11. Find the value of 0.472875 of a ton.

$$\begin{array}{r} 0.472875\text{ t.} \\ \underline{20} \\ 9.457500\text{ cwt.} \\ \underline{100} \\ 45.75\text{ lbs.} \\ \underline{16} \\ 12.00\text{ oz.} \end{array}$$

12.00 oz. *Ans.*

9 cwt. 45 lbs. 12 oz. *Ans.*

12. Reduce 12 cwt. 80 lbs. 6 oz. to the decimal of a ton.

6 oz. = 0.375 lb.

$\frac{1280.375}{2000} = 0.6401875$ t. *Ans.*

13. A farmer sold in one week 5.825 t. of hay. On Monday he sold 1350 lbs.; on Tuesday, $\frac{1}{2}$ t.; on Wednesday, $1\frac{1}{8}$ t.; on Thursday, 1.415 t.; on Friday, $1\frac{3}{4}$ t. What part of a ton did he sell on Saturday?

5.825 t. = 5 t. 1650 lbs.

	t.	lbs.
		1350
$\frac{1}{2}$ t. =		1000
$1\frac{1}{8}$ t. =	1	250
1.415 t. =	1	830
$1\frac{3}{4}$ t. =	1	1500
	5	930

t.	lbs.
5	1650
5	930
	720

$\frac{720}{2000} = 0.36$ t. *Ans.*

14. A grocer sold in one day 17 cwt. 83 lbs. 6 oz. of loaf sugar, 13 cwt. 95 lbs. 12 oz. of coffee sugar, 15 cwt. 78 lbs. 15 oz. of brown sugar. Required the whole amount sold.

t.	cwt.	lbs.	oz.
0	17	83	6
	13	95	12
	15	78	15
2	7	58	1

2 t. 7 cwt. 58 lbs. 1 oz. *Ans.*

15. A grocer has 7 cwt. 57 lbs. 12 oz. of Java coffee, 5 cwt. 39 lbs. 10 oz. of Mocha. After mixing the two kinds of coffee, he sells from the mixture 10 cwt. 97 lbs. 9 oz. How much coffee has he left?

cwt.	lbs.	oz.
7	57	12
5	39	10
12	97	6
10	97	9
1	99	13

1 cwt. 99 lbs. 13 oz. *Ans.*

16. A butcher receives from the West every day, Sundays excepted, 9 cwt. 81 lbs. 7 oz. of beef. How much does he receive per week?

t.	cwt.	lbs.	oz.
0	9	81	7
			6
2	18	88	10

2 t. 18 cwt. 88 lbs. 10 oz. *Ans.*

17. A man puts into his cellar 17 loads of coal, averaging 1 t. 387 lbs. a load. Required the whole amount.

t.	lbs.
1	387
	17
20	2000)6579
	3 t. 579 lbs.

20 t. 579 lbs. *Ans.*

18. Divide 19 t. 17 cwt. 58 lbs. by 9.

t.	lbs.
9)19	1758
2	$417\frac{5}{9}$

2 t. $417\frac{5}{9}$ lbs. *Ans.*

19. A farmer sells 4 oxen whose united weight is 2 t. 7 cwt. 29 lbs. 13 oz. What is their average weight?

t.	cwt.	lbs.	oz.
4)2	7	29	13
	11	82	$7\frac{1}{4}$

11 cwt. 82 lbs. $7\frac{1}{4}$ oz. *Ans.*

20. Find $\frac{3}{4}$ of 8 t. 16 cwt. $24\frac{3}{4}$ lbs.

$$\begin{array}{r|rrr}
 & \text{t.} & \text{cwt.} & \text{lbs.} \\
4) & 8 & 16 & 24\frac{3}{4} \\
\hline
 & 2 & 4 & 6\frac{3}{16} \\
 & & & 3 \\
\hline
 & 6 & 12 & 18\frac{9}{16}
\end{array}$$

6 t. 12 cwt. $18\frac{9}{16}$ lbs. *Ans.*

21. Divide 15 t. 17 cwt. 29 lbs. 7 oz. by $\frac{4}{5}$.

$$\begin{array}{r|rrrr}
 & \text{t.} & \text{cwt.} & \text{lbs.} & \text{oz.} \\
 & 15 & 17 & 29 & 7 \\
 & & & & 5 \\
\hline
4) & 79 & 6 & 47 & 3 \\
\hline
 & 19 & 16 & 61 & 12\frac{3}{4}
\end{array}$$

19 t. 16 cwt. 61 lbs. $12\frac{3}{4}$ oz. *Ans.*

Ex. 116. (*Oral.*) Page 181.

1. How many grains in 2 dwt.? in 2 dwt. 9 grs.? in 3 dwt. 7 grs.?

$2 \times 24 = 48$; $2\frac{9}{24} \times 24 = 57$; $3\frac{7}{24} \times 24 = 79$. *Ans.*

2. How many pennyweights in 24 grs.? $24 \div 24 = 1$. *Ans.*

3. How many pennyweights in 1 oz.? in 2 oz.? in 2 oz. 8 dwt.? in 5 oz. 17 dwt.?

20; $2 \times 20 = 40$; $2\frac{8}{20} \times 20 = 48$; $5\frac{17}{20} \times 20 = 117$. *Ans.*

4. How many ounces in 40 dwt.? in 100 dwt.? in 60 dwt.?

$40 \div 20 = 2$; $100 \div 20 = 5$; $60 \div 20 = 3$. *Ans.*

5. How many ounces in 1 lb.? in 5 lbs.? in 10 lbs.? in 3 lbs. 6 oz.? in 4 lbs. 9 oz.?

12; $5 \times 12 = 60$; $10 \times 12 = 120$; $3\frac{6}{12} \times 12 = 42$; $4\frac{9}{12} \times 12 = 57$. *Ans.*

6. How many pounds in 12 oz.? in 48 oz.? in 72 oz.? in 80 oz.? in 90 oz.?

1; $48 \div 12 = 4$; $72 \div 12 = 6$; $80 \div 12 = 6\frac{2}{3}$; $90 \div 12 = 7\frac{1}{2}$. *Ans.*

7. If 1 dwt. of gold is worth \$1.50, find the value of 1 oz. of gold; 1 lb. of gold.

$20 \times \$1.50 = \$30$; $12 \times \$30 = \$360$. *Ans.*

8. How many spoons weighing 25 dwt. each can be made from 1 lb. 3 oz. of silver?

$300 \div 25 = 12$. *Ans.*

9. If 10 dwt. of silver are worth 70 cts., find the value of 1 lb. of silver.

10 dwt. $= \frac{10}{20} = \frac{1}{2}$ oz. Hence 1 oz. $= \$1.40$.

1 lb. $= 12$ oz. Hence 12 oz. $= 12 \times \$1.40 = \$16.80$. *Ans.*

Ex. 117. Page 182.

1. Reduce 3 lbs. 9 oz. 18 dwt. 17 grs. to grains.

$$\begin{array}{rrrr}
\text{lbs.} & \text{oz.} & \text{dwt.} & \text{grs.} \\
3 & 9 & 18 & 17 \\
\underline{12} & & & \\
36 & & & \\
\underline{9} & & & \\
45 \text{ oz.} & & & \\
\underline{20} & & & \\
900 & & & \\
\underline{18} & & & \\
918 \text{ dwt.} & & & \\
\underline{24} & & & \\
22032 & & & \\
\underline{17} & & & \\
22049 \text{ grs. } \textit{Ans.} & & &
\end{array}$$

2. Reduce 25 lbs. 9 oz. 5 dwt. to pennyweights.

$$\begin{array}{rrr}
\text{lbs.} & \text{oz.} & \text{dwt.} \\
25 & 9 & 5 \\
\underline{12} & & \\
300 & & \\
\underline{9} & & \\
309 \text{ oz.} & & \\
\underline{20} & & \\
6180 & & \\
\underline{5} & & \\
6185 \text{ dwt. } \textit{Ans.} & &
\end{array}$$

3. Reduce 3420 dwt. to higher denominations.

$$\begin{array}{r|l}
2\cancel{0} & 342\cancel{0} \text{ dwt.} \\ \hline
12 & 171 \text{ oz.} \\ \hline
 & 14 \text{ lbs. } 3 \text{ oz.}
\end{array}$$

14 lbs. 3 oz. *Ans.*

4. What is the difference in weight between 3 doz. silver tablespoons weighing 5 lbs. 9 oz. 8 dwt. and 3 doz. silver teaspoons weighing 1 lb. 9 oz. 16 dwt. 18 grs.?

$$\begin{array}{rrrr}
\text{lbs.} & \text{oz.} & \text{dwt.} & \text{grs.} \\
5 & 9 & 8 & 0 \\
1 & 9 & 16 & 18 \\ \hline
3 & 11 & 11 & 6
\end{array}$$

3 lbs. 11 oz. 11 dwt. 6 grs. *Ans.*

5. Required the weight of 8 silver teapots, each weighing 3 lbs. 9 oz. 18 dwt. 13 grs.

$$\begin{array}{rrrr}
\text{lbs.} & \text{oz.} & \text{dwt.} & \text{grs.} \\
3 & 9 & 18 & 13 \\
 & & & 8 \\ \hline
30 & 7 & 8 & 8
\end{array}$$

30 lbs. 7 oz. 8 dwt. 8 grs. *Ans.*

6. When 12 tankards weigh 36 lbs. 8 oz. 14 dwt. 16 grs., what is their average weight?

$$\begin{array}{rrrrr}
 & \text{lbs.} & \text{oz.} & \text{dwt.} & \text{grs.} \\
12) & 36 & 8 & 14 & 16 \\ \hline
 & 3 & 0 & 14 & 13\frac{1}{3}
\end{array}$$

3 lbs. 14 dwt. 13⅓ grs. *Ans.*

7. Find the value of $\frac{8}{9}$ of a pound.

$\frac{8}{9} \times 12 \text{ oz.} = 10\frac{2}{3} \text{ oz.}$

$\frac{2}{3} \text{ oz.} \times 20 = 13\frac{1}{3} \text{ dwt.}$

$\frac{1}{3} \text{ dwt.} \times 24 = 8 \text{ grs.}$

10 oz. 13 dwt. 8 grs. *Ans.*

8. Reduce $\frac{4}{9}$ of a grain to the fraction of an ounce.

$$\frac{\cancel{4}}{9} \text{ of } \frac{1}{\underset{6}{\cancel{24}}} \text{ dwt.} = \frac{1}{54} \text{ dwt.}$$

$\frac{1}{54}$ of $\frac{1}{20}$ oz. $= \frac{1}{1080}$ oz. *Ans.*

9. Reduce 7 oz. 10 dwt. to the fraction of a pound.

10 dwt. $= \frac{10}{20} = \frac{1}{2}$ oz.

$\frac{7\frac{1}{2}}{12} = \frac{15}{24} = \frac{5}{8}$. $\frac{5}{8}$ lb. *Ans.*

10. Add 0.475 lbs., 0.75 dwt., 0.125 oz., 0.374 lbs.

0.475 lbs.
0.374 lbs.
0.849 lbs.
12
10.188 oz.
0.125
10.313 oz.
20
6.26 dwt.
0.75
7.01 dwt.
24
0.24 grs.

10 oz. 7 dwt. 0.24 grs. *Ans.*

11. From 0.675 lbs. subtract 5.25 oz.

0.675 lbs.
12
8.10 oz.
5.25
2.85 oz.
20
17.00 dwt.

2 oz. 17 dwt. *Ans.*

12. Reduce 1 oz. 7 dwt. 18 grs. to the decimal of a pound.

24)18.0 grs.
0.75 dwt.
7.
20)7.75 dwt.
0.3875 oz.
1.
12)1.3875 oz.
0.115625 lb. *Ans.*

13. Reduce $\frac{3}{4}$ dwt. to the fraction of a pound.

$\frac{\cancel{3}}{4} \times \frac{1}{20} \times \frac{1}{\underset{4}{\cancel{12}}} = \frac{1}{320}$. $\frac{1}{320}$ lb. *Ans.*

14. Reduce 4 oz. 4 dwt. to the fraction of a pound.

4 dwt. $= \frac{4}{20} = \frac{1}{5}$ oz.

$\frac{4\frac{1}{5}}{12} = \frac{21}{60} = \frac{7}{20}$.

$\frac{7}{20}$ lb. *Ans.*

15. What decimal of a pound is $\frac{7}{25}$ lb. $-$ $\frac{3}{4}$ oz.?

$\frac{7}{25}$ lb. = 0.28 lb.
$\frac{3}{4}$ oz. = 0.75 oz.
$\frac{0.75}{12} = 0.0625$ lb.

0.28 lb.
0.0625
0.2175 lb. *Ans.*

Ex. 118. Page 183.

1. In 4 lbs. 8 ℥ 4 ʒ 2 ℈ how many grains?

$$\begin{array}{r}
4\text{ lbs. }8\text{℥ }4\text{ʒ }2\text{℈}\\
\underline{12}\\
48\\
\underline{8}\\
56\text{℥}\\
\underline{8}\\
448\\
\underline{4}\\
452\text{ʒ}\\
\underline{3}\\
1356\\
\underline{2}\\
1358\text{℈}\\
\underline{20}\\
27{,}160\text{ grs. } \textit{Ans.}
\end{array}$$

2. In 7864 grs. how many pounds?

$$\begin{array}{r|l}
20 & 7864\text{ grs.}\\
3 & 393\text{℈ } 4\text{ grs.}\\
8 & 131\text{ ʒ}\\
12 & 16\text{ ℥ } 3\text{ʒ}\\
 & 1\text{ lb. }4\text{℥}
\end{array}$$

1 lb. 4 ℥ 3 ʒ 4 grs. *Ans.*

3. A patient is required to take daily 2ʒ 2℈ of bark. How many weeks will 7 lbs. of bark last him?

$2\text{ʒ } 2\text{℈} = 2\tfrac{2}{3}\text{ ʒ}.$

$\frac{2\frac{2}{3}}{8} = \frac{8}{24} = \frac{1}{3}\text{ʒ}.$

$\frac{\frac{1}{3}}{12} = \frac{1}{36}$ lb. a day.

$7 \times \frac{1}{36} = \frac{7}{36}$ a week.

$7 \div \frac{7}{36} = \cancel{7} \times \frac{36}{\cancel{7}} = 36.$

36 weeks. *Ans.*

4. Find the amount of 0.4 lb. 0.25 ℥ 0.375 ʒ 0.648 ℈ 2.147 grs.

$$\begin{array}{r}
0.4\text{ lb.}\\
\underline{12}\\
4.8\text{℥}\\
\underline{0.25}\\
5.05\text{℥}\\
\underline{8}\\
0.40\text{ʒ}\\
\underline{0.375}\\
0.775\text{ʒ}\\
\underline{3}\\
2.325\text{℈}\\
\underline{0.648}\\
2.973\text{℈}\\
\underline{20}\\
19.460\text{ grs.}\\
\underline{2.147}\\
21.607\text{ grs.}
\end{array}$$

5 ℥ 2 ℈ 21.607 grs. *Ans.*

5. Subtract 3 ℥ 7 ʒ 12 grs. from 9 ℥ 6 ʒ 1 ℈ 16 grs., and reduce the result to the decimal of a pound.

℥	ʒ	℈	grs.
9	6	1	16
3	7	0	12
5	7	1	4

$4\text{ grs.} = \frac{4}{20}\text{℈} = 0.2\text{℈}.$

$1.2\text{℈} = \frac{1.2}{3}\text{ʒ} = 0.4\text{ʒ}.$

$7.4\text{ʒ} = \frac{7.4}{8}\text{℥} = 0.925\text{℥}.$

$5.925\text{℥} = \frac{5.925}{12}\text{ lb.}$

$= 0.49375$ lb. *Ans.*

6. How many grains in 1 lb. of apothecaries' weight?

$$\begin{array}{r l} 1 & \text{lb.} \\ \underline{12} & \\ 12 & ℥ \\ \underline{8} & \\ 96 & ʒ \\ \underline{3} & \\ 288 & ℈ \\ \underline{20} & \\ 5760 & \text{grs. } \textit{Ans.} \end{array}$$

7. What part of a pound avoirdupois is a pound troy or a pound apothecaries' weight?

1 lb. troy or apoth. = 5760 grs.
1 lb. avoirdupois = 7000 grs.

1 lb. troy = $\frac{5760}{7000}$ lb. avoir.

$$\frac{\overset{144}{\cancel{5760}}}{\underset{175}{\cancel{7000}}} = \frac{144}{175}. \quad \textit{Ans.}$$

8. What part of an ounce avoirdupois is an ounce troy or an ounce apothecaries' weight?

$16\underline{)7000}$ grs.
$437\frac{1}{2}$ grs. = 1 oz. avoir.
$12\underline{)5760}$ grs.
480 grs. = 1 oz. apoth.

$$\frac{480}{437\frac{1}{2}} = \frac{960}{875} = 1\tfrac{17}{175}. \quad \textit{Ans.}$$

Ex. 119. (*Oral.*) Page 185.

1. How many seconds in 2 min.? in 3 min.?

$2 \times 60 = 120$; $3 \times 60 = 180$. *Ans.*

2. How many minutes in 2 hrs.? in 3 hrs.? in 60 sec.? in 120 sec.?

$2 \times 60 = 120$; $3 \times 60 = 180$; $60 \div 60 = 1$; $120 \div 60 = 2$. *Ans.*

3. How many hours in 2 dys.? in 3 dys.? in 120 min.? in 360 min.?

$2 \times 24 = 48$; $3 \times 24 = 72$; $120 \div 60 = 2$; $360 \div 60 = 6$. *Ans.*

4. How many days from Jan. 1 to Feb. 17, both days inclusive?

$31 + 17 = 48$. *Ans.*

5. How many months from Aug. 9 to Nov. 9? from March 5 to Sept. 5? from April 4 to Oct. 4? 3; 6; 6. *Ans.*

6. If a man can do a piece of work in 30 min., how many hours will it take him to do four times as much?

4×30 min. = 120 min. = 2 hrs. *Ans.*

7. If a man can walk a mile in 15 min., how many hours will it take him to walk 24 mi.?

24 × 15 min. = 360 min. = 6 hrs. *Ans.*

8. At the rate of 3 mi. an hour, how far will a man walk in 45 min.?

45 min. = ¾ hr. ¾ of 3 mi. = 2¼ mi. *Ans.*

9. If a man earns $12 a week, and pays for expenses $12 per month of 4 wks., how much will he save in 20 wks.?

If his expenses are $12 for 4 wks., they are $3 for 1 wk. Hence he saves $9 in 1 wk. In 20 wks. he saves 20 × $9 = $180. *Ans.*

10. If a man walks ¼ of a mile in 5 min., how many hours, at that rate, will it take him to walk 4 mi.?

It will take him 16 times as long to walk 4 mi. as ¼ of a mile.

16 × 5 min. = 80 min. = 1⅓ hrs. *Ans.*

Ex. 120. Page 185.

1. Reduce 4 yrs. 39 dys. 17 hrs. 22 min. 18 sec. to seconds.

$$\begin{array}{rlllll}
\text{yrs.} & \text{dys.} & \text{hrs.} & \text{min.} & \text{sec.} & \\
4 & 39 & 17 & 22 & 18 & \\
\underline{365} & & & & & \\
1460 & & & & & \\
\underline{39} & & & & & \\
1499 & \text{dys.} & & & & \\
\underline{24} & & & & & \\
35976 & & & & & \\
\underline{17} & & & & & \\
35993 & \text{hrs.} & & & & \\
\underline{60} & & & & & \\
2159580 & & & & & \\
\underline{22} & & & & & \\
2159602 & \text{min.} & & & & \\
\underline{60} & & & & & \\
129576120 & & & & & \\
\underline{18} & & & & & \\
129{,}576{,}138 & \text{sec.} & \textit{Ans.} & & &
\end{array}$$

2. In 48,967,349 sec. how many years?

$$\begin{array}{r|rl}
60 & 48967349 & \text{sec.} \\
60 & 816122 & \text{min. 29 sec.} \\
24 & 13602 & \text{hrs. 2 min.} \\
365 & 566 & \text{dys. 18 hrs.} \\
 & 1 & \text{yr. 201 dys.}
\end{array}$$

1 yr. 201 dys. 18 hrs. 2 min. 29 sec. *Ans.*

3. Find the exact length of the lunar month which contains 2,551,443 sec.

$$\begin{array}{r|rl}
60 & 2551443 & \text{sec.} \\
60 & 42524 & \text{min. 3 sec.} \\
24 & 708 & \text{hrs. 44 min.} \\
 & 29 & \text{dys. 12 hrs.}
\end{array}$$

29 dys. 12 hrs. 44 min. 3 sec. *Ans.*

4. How many seconds more are there in the 3 spring months than in the 3 autumn months?

March = 31 dys.	Sept. = 30 dys.
April = 30	Oct. = 31
May = 31	Nov. = 30
92 dys.	91 dys.

92 dys. – 91 dys. = 1 dy.

1 dy.
24
24 hrs.
60
1440 min.
60
86,400 sec. *Ans.*

5. Reduce $\frac{4}{5}$ of a year to days.

$\frac{4}{5}$ of 1 yr. = $\frac{4}{5}$ of 365 dys.
$\frac{4}{5}$ of 365 dys. = 292 dys. *Ans.*

6. Find the value of 0.375 yr. 0.142 dy. 0.27 min.

0.375 yr.
365
136.875
0.142
137.017 dys.
24
0.408 hr.
60
24.480
0.27
24.75 min.
60
45.00 sec.

137 dys. 24 min. 45 sec. *Ans.*

7. What part of a day are 12 hrs. 15 min. 25 sec.?

25 sec. = $\frac{25}{60}$ = $\frac{5}{12}$ min.

$15\frac{5}{12}$ min. = $\frac{15\frac{5}{12}}{60}$ hr. = $\frac{37}{144}$ hr.

$12\frac{37}{144}$ hrs. = $\frac{12\frac{37}{144}}{24}$ dy. = $\frac{1765}{3456}$ dy. *Ans.*

8. What part of 2 dys. 7 hrs. 18 min. are 1 dy. 3 hrs. 15 min.?

18 min. = $\frac{18}{60}$ hr. = $\frac{3}{10}$ hr.

$7\frac{3}{10}$ hrs. = $\frac{7\frac{3}{10}}{24}$ dy. = $\frac{73}{240}$ dy.

15 min. = $\frac{15}{60}$ hr. = $\frac{1}{4}$ hr.

$3\frac{1}{4}$ hrs. = $\frac{3\frac{1}{4}}{24}$ dy. = $\frac{13}{96}$ dy.

$$\frac{1\frac{13}{96}}{2\frac{73}{240}} = \frac{\overset{5}{\cancel{240}}}{553} \times \frac{109}{\underset{2}{\cancel{96}}} = \frac{545}{1106}. \textit{ Ans.}$$

9. How much greater is the quotient of 100 yrs. 25 dys. 12 hrs. 27 min. 28 sec. divided by 4 than the product of 4 yrs. 17 dys. 9 hrs. 12 min. 18 sec. multiplied by 5?

yrs.	dys.	hrs.	min.	sec.
4	17	9	12	18
				5
20	86	22	1	30
4)100	25	12	27	28
25	6	9	6	52
20	86	22	1	30
4	284	11	5	22

4 yrs. 284 dys. 11 hrs. 5 min. 22 sec. *Ans.*

10. Find the number of days, reckoning from noon of the one to noon of the other, between Feb. 24 and June 23, 1884; also between Dec. 25, 1884, and May 25, 1885.

4)1884 is leap year.
471

	dys.
Feb.,	5
March,	31
April,	30
May,	31
June,	23
	120 *Ans.*

4)1885 not leap year.
471-1

	dys.
Dec.,	6
Jan.,	31
Feb.,	28
March,	31
April,	30
May,	25
	151 *Ans.*

11. How many hours from noon of the 4th to midnight of the 7th of July, 1885?

Noon 4th to noon 7th = 3 dys.
Noon 7th to midnight 7th = 12 hrs.
3 dys. 12 hrs. = 3 × 24 + 12 = 84.
84 hrs. *Ans.*

12. Divide 11 wks. 6 dys. 18 hrs. by 9.

	wks.	dys.	hrs.	min.
9)	11	6	18	0
	1	2	7	20

1 wk. 2 dys. 7 hrs. 20 min. *Ans.*

13. Divide 2 yrs. 135 dys. 17 hrs. by 72.

2 yrs. = 730 dys.
135
72)865(12
864
1
24
17
41
60
72)2460(34
2448
12
60
72)720(10
720

12 dys. 34 min. 10 sec. *Ans.*

14. From 5 yrs. 17 hrs. take 2 yrs. 138 dys. 22 hrs.

yrs.	dys.	hrs.
5	0	17
2	138	22
2	226	19

2 yrs. 226 dys. 19 hrs. *Ans.*

15. Find the value of 3.1725 dys.

3.1725 dys.
24
4.1400 hrs.
60
8.4000 min.
60
24.0000 sec.

3 dys. 4 hrs. 8 min. 24 sec. *Ans.*

16. Find the value of 21.325 yrs.

21.325 yrs.
365
118.625 dys.
24
15.000 hrs.

21 yrs. 118 dys. 15 hrs. *Ans.*

17. Express 9 dys. 3 hrs. as the decimal of a week.

$$3\text{ hrs.} = \tfrac{3}{24}\text{ dy.} = \tfrac{1}{8}\text{ dy.}$$

$$9\tfrac{1}{8}\text{ dys.} = \frac{9\frac{1}{8}}{7}\text{ wk.} = \tfrac{73}{56}\text{ wk.}$$

$$\begin{array}{r} 56\overline{)73\quad\quad} \\ 1.30357 \end{array}\ \textit{Ans.}$$

18. Express 13 hrs.. 15 min. 17 sec. as the fraction of 6 dys. 1 hr. 48 min. 7 sec.

$$\begin{array}{rrr}
\text{hrs.} & \text{min.} & \text{sec.} \\
13 & 15 & 17 \\
\underline{60} & & \\
780 & & \\
\underline{15} & & \\
795\text{ min.} & & \\
\underline{60} & & \\
47700 & & \\
\underline{17} & & \\
47717\text{ sec.} & &
\end{array}$$

$$\begin{array}{rrrr}
\text{dys.} & \text{hr.} & \text{min.} & \text{sec.} \\
6 & 1 & 48 & 7 \\
\underline{24} & & & \\
144 & & & \\
\underline{1} & & & \\
145\text{ hrs.} & & & \\
\underline{60} & & & \\
8700 & & & \\
\underline{48} & & & \\
8748\text{ min.} & & & \\
\underline{60} & & & \\
524880 & & & \\
\underline{7} & & & \\
524887 & & &
\end{array}$$

$$\frac{47717}{524887} = \frac{1}{11}.\ \textit{Ans.}$$

19. Express 3 dys. 20 hrs. 35 min. 33 sec. as the decimal of 27 dys. 13 hrs. 22 min. 30 sec.

$$\begin{array}{rrrr}
\text{dys.} & \text{hrs.} & \text{min.} & \text{sec.} \\
3 & 20 & 35 & 33 \\
\underline{24} & & & \\
72 & & & \\
\underline{20} & & & \\
92\text{ hrs.} & & & \\
\underline{60} & & & \\
5520 & & & \\
\underline{35} & & & \\
5555\text{ min.} & & & \\
\underline{60} & & & \\
333300 & & & \\
\underline{33} & & & \\
333333\text{ sec.} & & &
\end{array}$$

$$\begin{array}{rrrr}
\text{dys.} & \text{hrs.} & \text{min.} & \text{sec.} \\
27 & 13 & 22 & 30 \\
\underline{24} & & & \\
648 & & & \\
\underline{13} & & & \\
661\text{ hrs.} & & & \\
\underline{60} & & & \\
39660 & & & \\
\underline{22} & & & \\
39682\text{ min.} & & & \\
\underline{60} & & & \\
2380920 & & & \\
\underline{30} & & & \\
2380950\text{ sec.} & & &
\end{array}$$

$$\frac{333333}{3380950} = \frac{37037}{264550}.$$

$$\begin{array}{r} 264550\overline{)37037.0} \\ 0.14 \end{array}\ \textit{Ans.}$$

20. Find the value of 5.58 yrs.

$$\begin{array}{r}
5.58\text{ yrs.} \\
\underline{365} \\
211.70\text{ dys.} \\
\underline{24} \\
16.80\text{ hrs.} \\
\underline{60} \\
48.00\text{ min.}
\end{array}$$

5 yrs. 211 dys. 16 hrs. 48 min. *Ans.*

Ex. 121. Page 187.

1. On the 1st of January, 1885, how much time had passed since the discovery of the Island of San Salvador, Oct. 12, 1492?

yrs.	mos.	dys.
1885	1	1
1492	10	12
392	2	19

392 yrs. 2 mos. 19 dys. *Ans.*

2. At the birth of Lafayette, Sept. 6, 1757, what was the age of George Washington, born Feb. 22, 1732?

yrs.	mos.	dys.
1757	9	6
1732	2	22
25	6	14

25 yrs. 6 mos. 14 dys. *Ans.*

3. If a note is dated March 5, 1885, and has 3 mos. 3 dys. to run, when is the note due?

yrs.	mos.	dys.
1885	3	5
	3	3
1885	6	8

June 8, 1885. *Ans.*

4. If a note is discounted Feb. 1, and is due April 22, how many months and days has it to run?

	dys.
Feb.,	28
March,	31
April,	22

30)81

2-21

2 mos. 21 dys. *Ans.*

5. Find the exact number of days from Sept. 23 to Jan. 11.

	dys.
Sept.,	7
Oct.,	31
Nov.,	30
Dec.,	31
Jan.,	11
	110 *Ans.*

6. Find the exact number of days between March 5 and July 4.

	dys.
March,	26
April,	30
May,	31
June,	30
July,	4
	121 *Ans.*

7. Find the exact number of days between June 3 and Nov. 1.

	dys.
June,	27
July,	31
Aug.,	31
Sept.,	30
Oct.,	31
Nov.,	1
	151 *Ans.*

8. Find the exact number of days between Feb. 3 and June 3, of a common year.

	dys.
Feb.,	25
March,	31
April,	30
May,	31
June,	3
	120 *Ans.*

9. Find the difference between June 7, 1885, and July 4, 1776.

$$\begin{array}{rrr} \text{yrs.} & \text{mos.} & \text{dys.} \\ 1885 & 6 & 7 \\ 1776 & 7 & 4 \\ \hline 108 & 11 & 3 \end{array}$$

108 yrs. 11 mos. 3 days. *Ans.*

Ex. 122. Page 189.

1. Reduce 49° 37′ 29″ to seconds.

$$\begin{array}{r} 49^\circ\ 37'\ 29'' \\ 60 \\ \hline 2940 \\ 37 \\ \hline 2977 \\ 60 \\ \hline 178620 \\ 29 \\ \hline 178{,}649 \end{array}$$

178,649 *Ans.*

2. In 13,978″ how many degrees?

$$\begin{array}{r|l} 60 & 13978'' \\ \hline 60 & \ 232'\ 58'' \\ \hline & \quad 3^\circ\ 52' \end{array}$$

3° 52′ 58″. *Ans.*

3. Find the value of $\frac{4}{7}$ of 360°.

$\frac{4}{7}$ of 360° = $205\frac{5}{7}$°

$\frac{5}{7}$ of 60′ = $42\frac{6}{7}$′

$\frac{6}{7}$ of 60″ = $51\frac{3}{7}$″

205° 42′ $51\frac{3}{7}$″. *Ans.*

4. What part of the whole angular magnitude about a point is $\frac{3}{5}$ of a second?

$$\begin{array}{r} 360^\circ \\ 60 \\ \hline 21600' \\ 60 \\ \hline 1{,}296{,}000'' \end{array}$$

$$\frac{1}{\cancel{1296000}_{\,432000}} \times \frac{\cancel{3}}{5} = \frac{1}{2160000}. \ \textit{Ans.}$$

5. Find the sum of 45.425°, 0.115′, 0.255″.

$$\begin{array}{r} 45.425^\circ\ 0.115'\ 0.255'' \\ 60 \\ \hline 25.500 \\ 0.115 \\ \hline 25.615' \\ 60 \\ \hline 36.900 \\ 0.255 \\ \hline 37.155'' \end{array}$$

45° 25′ 37.155″. *Ans.*

6. Change 0.471 of a minute to the decimal of a degree.

$$\begin{array}{r} 60\overline{)0.471'} \\ 0.00785^\circ \end{array}$$

0.00785° *Ans.*

7. What part of 7° 35′ 15″ are 3° 20′ 45″?

$$\begin{array}{rcr} 7^\circ\ 35'\ 15'' & & 3^\circ\ 20'\ 45'' \\ 60 & & 60 \\ \hline 420 & & 180 \\ 35 & & 20 \\ \hline 455' & & 200' \\ 60 & & 60 \\ \hline 27300 & & 12000 \\ 15 & & 45 \\ \hline 27315'' & & 12045'' \end{array}$$

$$\frac{12045}{27315} = \frac{803}{1821}. \ \textit{Ans.}$$

8. Divide 17° 27′ 13″ by 5; multiply 8° 19′ 47″ by 8; and find the difference between the results.

$$\begin{array}{r|rrr} 5 & 17^\circ & 27' & 13'' \\ \hline & 3 & 29 & 26\frac{3}{5} \end{array}$$

$$\begin{array}{rrr} 8^\circ & 19' & 47'' \\ & & 8 \\ \hline 66 & 38 & 16 \\ 3 & 29 & 26\frac{3}{5} \\ \hline 63 & 8 & 49\frac{2}{5} \end{array}$$

63° 8′ 49⅖″. *Ans.*

9. From 7° 0′ 18″ subtract 3° 47′ 36″.

$$\begin{array}{rrr} 7^\circ & 0' & 18'' \\ 3 & 47 & 36 \\ \hline 3 & 12 & 42 \end{array}$$

3° 12′ 42″. *Ans.*

10. The latitude of New York is 40° 42′ 43″ North; the latitude of Boston is 42° 21′ 30″ North. Find their difference in latitude.

$$\begin{array}{rrr} 42^\circ & 21' & 30'' \\ 40 & 42 & 43 \\ \hline 1 & 38 & 47 \end{array}$$

1° 38′ 47″. *Ans.*

11. The latitude of New Orleans is 29° 57′ 46″ North; the latitude of Rio Janeiro is 22° 56′ South. Find their difference in latitude.

$$\begin{array}{rrr} 29^\circ & 57' & 46'' \\ 22 & 56 & \\ \hline 52 & 53 & 46 \end{array}$$

52° 53′ 46″. *Ans.*

Ex. 123. (*Oral.*) Page 190.

1. How many shillings in 48 *d.*? in 60 *d.*?
   48 ÷ 12 = 4; 60 ÷ 12 = 5. *Ans.*
2. How many pence in 5 *s.*? in 10 *s.*? in a sovereign?
   5 × 12 *d.* = 60 *d.*; 10 × 12 *d.* = 120 *d.*; 20 × 12 *d.* = 240 *d.* *Ans.*
3. How many shillings in £3½? in £2¾?
   3½ × 20 *s.* = 70 *s.*; 2¾ × 20 *s.* = 55 *s.* *Ans.*
4. How many pounds in 95 *s.*? in 100 *s.*?
   95 ÷ 20 = 4¾; 100 ÷ 20 = 5. *Ans.*
5. How many pence in a crown? in a florin?
   5 × 12 *d.* = 60 *d.*; 2 × 12 *d.* = 24 *d.* *Ans.*
6. How many shillings in a guinea? in a half-sovereign?
   21; ½ of 20 *s.* = 10 *s.* *Ans.*
7. What part of a pound are 4 *s.*? 5 *s.*? 8 *s.*?
   $\frac{4}{20} = \frac{1}{5}$; $\frac{5}{20} = \frac{1}{4}$; $\frac{8}{20} = \frac{2}{5}$. *Ans.*

8. What part of a shilling are 6 *d.*? 4 *d.*? 3 *d.*?

$\frac{6}{12} = \frac{1}{2}$; $\frac{4}{12} = \frac{1}{3}$; $\frac{3}{12} = \frac{1}{4}$. *Ans.*

9. How many pence in 1 *s.* 3 *d.*? in 2 *s.* 6 *d.*? in 3 *s.* 2 *d.*?

15; 30; 38. *Ans.*

Ex. 124. Page 191.

1. Reduce £432 15 *s.* 10 *d.* to pence.

$$\begin{array}{r} \pounds 432\ 15\,s.\ 10\,d. \\ \underline{20} \\ 8640 \\ \underline{15} \\ 8655\ s. \\ \underline{12} \\ 103860 \\ \underline{10} \\ 103{,}870\ d.\ \textit{Ans.} \end{array}$$

2. Change 4238 farthings to higher denominations.

$$\begin{array}{r|l} 4 & 4238\ \text{far.} \\ 12 & 1059\tfrac{1}{2}\ d. \\ 20 & 88\ s.\ 3\tfrac{1}{2}\ d. \\ & 4\ \pounds\ 8\ s. \end{array}$$

£4 8 *s.* 3½ *d.* *Ans.*

3. Express in dollars the value of £18.

$$\begin{array}{r} \$4.866\tfrac{1}{2} \\ \underline{18} \\ \$87.597\ \textit{Ans.} \end{array}$$

4. Express in English money $60.83.

$$4.8665\overline{)60.8300}$$
$$12.5$$

£12 10 *s.* *Ans.*

5. Express in United States money £3 16 *s.*

16 *s.* = £$\frac{16}{20}$ = £$\frac{4}{5}$.

$$\begin{array}{r} \$4.8665 \\ \underline{3\tfrac{4}{5}} \\ \$18.4927 \end{array}$$

$18.49. *Ans.*

6. How many sovereigns are equal in value to $389.32?

$$4.8665\overline{)389.32}$$
80 sov. *Ans.*

7. Reduce $\frac{4}{5}$ *s.* to the fraction of a guinea.

$\frac{4}{5}$ of $\frac{1}{21} = \frac{4}{105}$. *Ans.*

8. What part of 13 *s.* 2 *d.* 1 farthing are 9 *s.* 10 *d.* 2 farthings?

13 *s.* 2 *d.* 1 far.	9 *s.* 10 *d.* 2 far.
12	12
156	108
2	10
158 *d.*	118 *d.*
4	4
632	472
1	2
633	474

$\frac{474}{633} = \frac{158}{211}$. *Ans.*

9. Find the value of £5.375.

£5.375
20
7.500 *s.*
12
6.000 *d.*

£5 7 *s.* 6 *d.* *Ans.*

10. Reduce 6 *s.* 5 *d.* 3.04 farthings to the decimal of a pound.

4)3.04 far.
0.76
5
12)5.76 *d.*
0.48
6
20)6.48 *s.*
£0.324 *Ans.*

11. Express in pounds £5 9 *s.* 3 *d.*

3 *d.* $= \frac{3}{12} = \frac{1}{4} = 0.25$ *s.*

9.25 *s.* $= \frac{9.25}{20} =$ £0.4625.

£5.4625. *Ans.*

12. Add £0.75, 0.125 guinea, 0.54 *s.*, 0.55 *d.*

£0.75 0.125 gui.
20 21
15.00 *s.* 2.625 *s.*
2.625
0.54
18.165 *s.*
12
1.980
0.55
2.53 *d.*
4
2.12 far.

18 *s.* 2 *d.* 2.12 far. *Ans.*

Ex. 125. Page 192.

1. How many barrels in 75 t. of beef?

2000
75
$2\cancel{0}\cancel{0})1500\cancel{0}\cancel{0}$ lbs.
750 bbls. *Ans.*

2. In a car-load of 36,000 lbs. of wheat, how many bushels?

$6\cancel{0})3600\cancel{0}$ lbs.
600 bu. *Ans.*

3. Find the weight of 27 bu. of potatoes.

60
27
1620 lbs. *Ans.*

4. How much paper will be used by an author who sends to a semi-weekly paper 6 sheets of manuscript twice a week for a year?

52
2
104
6
24 | 624 sheets.
20 | 26 qu.
1 rm. 6 qu. *Ans.*

5. Reduce $\frac{7}{8}$ of a quire to the fraction of a bundle.

$\frac{7}{8}$ qu. $= \frac{\frac{7}{8}}{20}$ rm. $= \frac{7}{160}$ rm.

$\frac{7}{160}$ rm. $= \frac{\frac{7}{160}}{2} = \frac{7}{320}$ bundle. *Ans.*

6. Reduce 2 bundles 6 quires 6 sheets to the fraction of 2 bales 1 bundle.

$$\begin{array}{rl} 2 & \text{bdls. 6 qu. 6 sh.} \\ \underline{2} & \\ 4 & \text{rms.} \\ \underline{20} & \\ 80 & \\ \underline{6} & \\ 86 & \text{qu.} \\ \underline{24} & \\ 2064 & \\ \underline{6} & \\ 2070 & \text{sh.} \end{array}$$

$$\begin{array}{rl} 2 & \text{bales 1 bdl.} \\ \underline{5} & \\ 10 & \\ \underline{1} & \\ 11 & \text{bdls.} \\ \underline{2} & \\ 22 & \text{rms.} \\ \underline{20} & \\ 440 & \text{qu.} \\ \underline{24} & \\ 10560 & \text{sh.} \end{array}$$

$\frac{2070}{10560} = \frac{69}{352}$. *Ans.*

7. Reduce 3 bundles 7 quires 18 sheets to the decimal fraction of a bale.

18 sh. $= \frac{18}{24}$ qu. $= 0.75$ qu.

7.75 qu. $= \frac{7.75}{20} = 0.3875$ rm.

0.3875 rm. $= \frac{0.3875}{2} = 0.19375$ bdl.

3.19375 bdls. $= \frac{3.19375}{5}$ bale

$= 0.63875$ bale. *Ans.*

8. A button manufactory makes 96 dozen buttons a day. How many great gross will it make in 24 wks.?

96 doz. $= \frac{2}{3}$ great gross.

$\frac{2}{\cancel{3}} \times \overset{2}{\cancel{6}} \times 24 = 96$ great gross.

96. *Ans.*

9. Find the weight of 103 bu. 3 pks. 4 qts. of barley.

4 qts. $= \frac{1}{2}$ pk.

$3\frac{1}{2}$ pks. $= \frac{3\frac{1}{2}}{4}$ bu. $= \frac{7}{8}$ bu.

$103\frac{7}{8} \times 48$ lbs. $= 4986$ lbs. *Ans.*

10. In 5 t. 624 lbs. of oats, how many bushels?

$$\begin{array}{rl} 5 & \text{t. 624 lbs.} \\ \underline{2000} & \\ 10000 & \\ \underline{624} & \\ 32\overline{)10624} & \text{lbs.} \\ 332 & \text{bu. } \textit{Ans.} \end{array}$$

Ex. 126. Page 194.

1. The difference in time between New York and Paris is 5 hrs. 5 min. 20 sec. What is the difference in longitude?

$$\begin{array}{rrr} 5\text{ hrs.} & 5\text{ min.} & 20\text{ sec.}\\ & & 15\\ \hline 76 & 20 & 0 \end{array}$$

76° 20′. *Ans.*

2. Boston is 71° 3′ and San Francisco 122° 26′ west of Greenwich. What is the difference in clock-time between the two cities?

$$\begin{array}{rrrr} & 122^\circ & 26' & 0''\\ & 71 & 3 & \\ \hline 15) & 51 & 23 & 0\\ \hline & 3 & 25 & 32 \end{array}$$

3 hrs. 25 min. 32 sec. *Ans.*

3. The difference in clock-time between New York and Canton is 12 hrs. 28 min. 12 sec. Find the difference in longitude.

$$\begin{array}{rrr} 12\text{ hrs.} & 28\text{ min.} & 12\text{ sec.}\\ & & 15\\ \hline 187 & 3 & \end{array}$$

187° 3′. *Ans.*

4. The difference in longitude between Cincinnati and Boston is 13° 26′. Find the difference in time.

$$\begin{array}{rrrr} 15) & 13^\circ & 26' & 0''\\ \hline & & 53 & 44 \end{array}$$

53 min. 44 sec. *Ans.*

5. New York is 74° and Cincinnati is 84° 30′ west longitude. Find the difference in time.

$$\begin{array}{rrr} & 84^\circ & 30'\\ & 74 & \\ \hline 15) & 10 & 30\\ \hline & & 42 \end{array}$$

42 min. *Ans.*

6. The difference in time between Canton and Cincinnati is 13 hrs. 10 min. 8 sec. Find the difference in longitude.

$$\begin{array}{rrr} 13\text{ hrs.} & 10\text{ min.} & 8\text{ sec.}\\ & & 15\\ \hline 197 & 32 & \end{array}$$

197° 32′. *Ans.*

7. The difference in longitude between New York and Canton is 187° 3′. What is the difference in time?

$$\begin{array}{rrrr} 15) & 187^\circ & 3' & 0''\\ \hline & 12 & 28 & 12 \end{array}$$

12 hrs. 28 min. 12 sec. *Ans.*

8. Find the difference in time between Philadelphia, longitude 75° 10′ West, and Buenos Ayres, longitude 58° 22′ West.

$$\begin{array}{rrrr} & 75^\circ & 10' & 0''\\ & 58 & 22 & \\ \hline 15) & 16 & 48 & 0\\ \hline & 1 & 7 & 12 \end{array}$$

1 hr. 7 min. 12 sec. *Ans.*

9. The difference of time between St. Petersburgh and New Orleans is 8 hrs. 1 min. 16 sec. What is the difference in longitude?

$$\begin{array}{lll} & \text{8 hrs. 1 min. 16 sec.} & \\ & & 15 \\ \hline 120 & 19 & \end{array}$$

120° 19′. *Ans.*

10. Find the difference in time between the Cape of Good Hope, longitude 18° 28′ East, and Halifax, longitude 63° 36′ West.

$$\begin{array}{rrr} 18^\circ & 28' & 0'' \\ 63 & 36 & \\ \hline 15)82 & 4 & 0 \\ \hline 5 & 28 & 16 \end{array}$$

5 hrs. 28 min. 16 sec. *Ans.*

Ex. 127. Page 196.

1. When it is noon at Chicago, what is the hour at New York, the difference in longitude being 13° 37′?

$$\begin{array}{rrr} 15)13^\circ & 37' & 0'' \\ \hline & 54 & 28 \end{array}$$

54 min. 28 sec. past noon. *Ans.*

2. What is the time in London when it is half-past 3 in the afternoon at Constantinople, Constantinople being 29° east of London?

$$\begin{array}{rr} 15)29^\circ & 0' \\ \hline 1 & 56 \end{array}$$

$$\begin{array}{ll} \text{3 hrs.} & \text{30 min.} \\ 1 & 56 \\ \hline 1 & 34 \end{array}$$

34 min. past 1. *Ans.*

3. The longitude of New York is 74° West, that of Paris is 2° 20′ East. When it is 15 minutes past 10 A.M. in New York, what is the time in Paris?

$$\begin{array}{rrr} 74^\circ & 0'\ \text{W.} & \\ 2 & 20\ \text{E.} & \\ \hline 15)76 & 20 & \\ \hline 5 & 5 & 20\ \text{sec.} \end{array}$$

$$\begin{array}{lll} \text{10 hrs.} & \text{15 min.} & \\ 5 & 5 & 20\ \text{sec.} \\ \hline 15 & 20 & 20 \\ 12 & & \\ \hline 3 & 20 & 20 \end{array}$$

20 min. 20 sec. past 3. *Ans.*

4. The longitude of Boston is 71° 3′ and that of New York 74° West. What is the time in Boston when it is midnight in New York?

$$\begin{array}{rrr} 74^\circ & 0' & 0'' \\ 71 & 3 & \\ \hline 15)\ 2 & 57 & 0 \\ \hline & 11 & 48 \end{array}$$

11 min. 48 sec. past 12 A.M. *Ans.*

5. The difference in longitude between San Francisco and Chicago is 34° 49′. What time is it at San Francisco when it is 9 o'clock P.M. at Chicago?

$$\begin{array}{rrr} 15)34^\circ & 49' & 0'' \\ \hline 2 & 19 & 16 \end{array}$$

$$\begin{array}{lll} \text{9 hrs.} & \text{min.} & \text{sec.} \\ 2 & 19 & 16 \\ \hline 6 & 40 & 44 \end{array}$$

40 min. 44 sec. past 6 P.M. *Ans.*

6. Paris is 45° 10′ east of Rio Janeiro. What time is it at Rio Janeiro when it is 7 o'clock P.M. at Paris?

$$\begin{array}{r|rrr} 15 & 45^\circ & 10' & 0'' \\ \hline & 3 & 0 & 40 \end{array}$$

$$\begin{array}{rrr} 7\text{ hrs.} & \text{min.} & \text{sec.} \\ 3 & 0 & 40 \\ \hline 3 & 59 & 20 \end{array}$$

40 sec. before 4 P.M. *Ans.*

7. If the sun rises at half-past 4, when it is sunrise at Richmond, Va., what is the time at Rouen, France, the difference of longitude being 78° 46′?

$$\begin{array}{r|rrr} 15 & 78^\circ & 46' & 0''. \\ \hline & 5 & 15 & 4 \end{array}$$

$$\begin{array}{rrr} 4\text{ hrs.} & 30\text{ min.} & 0\text{ sec.} \\ 5 & 15 & 4 \\ \hline 9 & 45 & 4 \end{array}$$

45 min. 4 sec. past 9. *Ans.*

8. The French residents in Calcutta wish to unite with the people of Paris in a celebration to occur at 3 o'clock P.M. Paris is 2° 20′ East, Calcutta 88° 27′ East. At what hour must the festivities begin in Calcutta?

$$\begin{array}{r|rrr} & 88^\circ & 27' & 0'' \\ & 2 & 20 & 0 \\ \hline 15 & 86 & 7 & 0 \\ \hline & 5 & 44 & 28 \end{array}$$

$$\begin{array}{rrr} 3\text{ hrs.} & 0\text{ min.} & 0\text{ sec.} \\ 5 & 44 & 28 \\ \hline 8 & 44 & 28 \end{array}$$

44 min. 28 sec. past 8 P.M. *Ans.*

Ex. 128. Page 197.

1. To 5 yds. ribbon	@ 62½ cts.	. . . .	$3.12½
3 yds. satin	@ $4.375	. . . .	13.12½
4 papers pins	@ 12½ cts.	. . . .	0.50
1 sun-hat	@ 75 cts.	. . . .	0.75
			$17.50

How much change out of a 20-dollar bill should the purchaser receive?

$$\begin{array}{r} \$20.00 \\ 17.50 \\ \hline \$2.50 \end{array}$$ *Ans.*

2. To 27 yds. of flannel	@ 80 cts. a yard	. . . .	$21.60
32 yds. of calico	@ 11 cts. a yard	. . . .	3.52
3⅓ doz. of stockings	@ $2 per dozen	. . . .	6.66⅔
6 pairs of gloves	@ 84 cts. a pair	. . . .	5.04
4 collars	@ 35 cts. each	. . . . .	1.40
			$38.23 *Ans.*

3. To	10 lbs. of sugar	@ 10 cts. a pound . . .	$1.00
	6 lbs. of tea	@ 88 cts. a pound . . .	5.28
	8 lbs. of coffee	@ 32 cts. a pound . . .	2.56
	12 lbs. of currants	@ 11½ cts. a pound . . .	1.38
	10 lbs. of rice	@ 9 cts. a pound . . .	0.90
			$11.12 *Ans.*

4. To	18½ lbs. of beef	@ 22 cts. a pound . . .	$4.07
	10¼ lbs. of mutton	@ 21 cts. a pound . . .	2.15¼
	7½ lbs. of pork	@ 17 cts. a pound . . .	1.27½
	16 lbs. of veal	@ 16 cts. a pound . . .	2.56
	14¾ lbs. of ham	@ 20 cts. a pound . . .	2.95
			$13.01 *Ans.*

5. To	5½ lbs. of soap	@ 9½ cts. a pound . . .	$0.52¼
	3½ lbs. of candles	@ 13 cts. a pound . . .	0.45½
	2 lbs. of butter	@ 35 cts. a pound . . .	0.70
	56 lbs. of rice	@ 4½ cts. a pound . . .	2.52
			$4.20 *Ans.*

6. To	7 doz. and 4 eggs	@ 18 cts. per dozen . . .	$1.32
	19 lbs. of soap	@ 11 cts. per pound . .	2.09
	18 lbs. of butter	@ 28 cts. per pound . .	5.04
	13½ lbs. of cheese	@ 15 cts. per pound . .	2.02½
	½ lb. pepper	@ 2½ cts. per ounce . .	0.20
			$10.68 *Ans.*

7. To	12½ t. of hay	@ $18 a ton	$225.00
	66 bu. of rye	@ $1.26 a bushel	83.16
	102 bu. of barley	@ 78 cts. a bushel	79.56
	5 bbls. of flour	@ $6.60 a barrel	33.00
			$420.72 *Ans.*

8. A man walks 1 mi. 47 rds. in 20 min. How many hours will it take him to walk 41 mi. 92 rds.?

1 mi. 47 rds. = 367 rds.
367 rds. in 20 min. = 367 × 3 = 1101 rds. in 1 hr.
41 mi. 92 rds. = 13,212 rds.
1101)13212
12 12 hrs. *Ans.*

9. Required the cubic feet of a box 6 ft. 6 in. long, 4 ft. 9 in. wide, and 3 ft. 3 in. deep.

$$6\tfrac{1}{2} \times 4\tfrac{3}{4} \times 3\tfrac{1}{4} = \tfrac{13}{2} \times \tfrac{19}{4} \times \tfrac{13}{4} = \tfrac{3211}{32} = 100\tfrac{11}{32}.\ \textit{Ans.}$$

10. What will be the weight of a wall of brick-work 10 ft. long, 1½ ft. thick, 4⅙ ft. high, if each cubic foot weighs 120 lbs.?

$$10 \times 1\tfrac{1}{2} \times 4\tfrac{1}{6} = \frac{\overset{5}{\cancel{10}}}{1} \times \frac{\cancel{3}}{\cancel{2}} \times \frac{25}{\underset{2}{\cancel{6}}} = \frac{125}{2}.$$

$$\frac{125}{\cancel{2}} \times \frac{\overset{60}{\cancel{120}}}{1}\text{ lbs.} = 7500\text{ lbs. }\textit{Ans.}$$

11. How many cubic yards of earth will be cut out of a drain 420 ft. long, 2 ft. wide, and 4 ft. deep?

$420 \times 2 \times 4 = 3360.$ $27\overline{)3360}$ cu. ft.

$124\tfrac{4}{9}$ cu. yds. *Ans.*

12. What will be the expense of glazing a window of 16 squares, each 1⅙ ft. long and ⅚ ft. wide, at $1.08 per square foot?

$$1\tfrac{1}{6} \times \tfrac{5}{6} = \tfrac{7}{6} \times \tfrac{5}{6} = \tfrac{35}{36}.$$

$$\frac{35}{\underset{9}{\cancel{36}}} \times \frac{\overset{4}{\cancel{16}}}{1} = \frac{140}{9}.$$

$$\frac{140}{\cancel{9}} \times \frac{\overset{0.12}{\cancel{1.08}}}{1} = 16.80.$$

$16.80. *Ans.*

13. What length must be cut off an inch-board 9 in. wide to obtain 4 ft. board measure?

9 in. = ¾ ft. $\dfrac{4}{\frac{3}{4}}$ ft. = $\tfrac{16}{3}$ ft. = 5⅓ ft. *Ans.*

14. How many boards each 11½ ft. long, and 10 in. wide will be required for the flooring of a room 23 ft. long and 17 ft. 6 in. wide?

The room is $\dfrac{23}{11\frac{1}{2}}$ ft. = 2 boards long; and 17 ft. 10 in. = 210 in. wide.

$\tfrac{210}{10}$ in. = 21 boards. $21 \times 2 = 42$. *Ans.*

15. A farm of 22½ acres is divided into house-lots measuring 75 yds. in length by 33 yds. in breadth. How many lots are there?

22½ A. = 22½ × 160 × 30¼ = 108,900 sq. yds.
Each lot is 75 × 33 yds. = 2475 sq. yds.
$2475\overline{)108900}$
44 *Ans.*

16. At 9 cts. per cubic foot, what will be the cost of a block of stone 9 ft. long, 5½ ft. wide, and 4 ft. thick?

$$9 \times 5\tfrac{1}{2} \times 4 = 198. \qquad 198 \times \$0.09 = \$17.82.\ \textit{Ans.}$$

17. At 50 cts. an ounce, what is the value of a silver cup weighing 15 oz. 12 dwt. 12 grs.?

$$12 \text{ grs.} = 0.5 \text{ dwt.}$$

$$12.5 \text{ dwt.} = \frac{12.5}{20} = \frac{2.5}{4} = 0.625 \text{ oz.}$$

$$15.625 \times \$0.50 = \$7.8125.\ \textit{Ans.}$$

18. If the cost of making a barrel of flour into bread is $2.20, and flour is worth $9 a barrel, what should a baker receive for a loaf containing 1¾ lbs. of flour?

$$\$2.20 + \$9 = \$11.20 = \text{cost of loaves.}$$

$$\frac{196}{1\frac{3}{4}} \text{ lbs.} = \frac{\overset{28}{\cancel{196}}}{1} \times \frac{4}{\cancel{7}} = 112 = \text{number of loaves.}$$

$$\$\frac{11.20}{112} = \$0.10 = \text{price of loaf. } \textit{Ans.}$$

19. At $30 per M., what is the value of a stick of timber 24 ft. long, and 2 ft. square at the end?

$$2 \times 24 \times 24 = 1152 = \text{number of board feet.}$$

$$\tfrac{1152}{1000} \times \$30 = 1.152 \times \$30 = \$34.56.\ \textit{Ans.}$$

20. A schoolroom is 44 ft. long, 28½ ft. wide, and 13 ft. high. What will be the cost of painting the four walls and the ceiling, at the rate of 18 cents a square yard, making no allowance for doors and windows?

$$44 \times 28\tfrac{1}{2} = 1254 = \text{square feet of ceiling.}$$

$$2 \times 44 \times 13 = 1144 = \text{square feet of side walls.}$$

$$2 \times 28\tfrac{1}{2} \times 13 = 741 = \text{square feet of end walls.}$$

$$1254 + 1144 + 741 = 3128 = \text{total square feet of painting.}$$

$$\tfrac{3128}{9} \text{ sq. ft.} = 348\tfrac{7}{9} \text{ sq. yds.} \qquad 348\tfrac{7}{9} \times \$0.18 = \$62.78.\ \textit{Ans.}$$

21. A druggist pays 50 cts. a pound avoirdupois for chloride of potash, and retails it in powders containing 1 ℈ 5 grs., at 5 cts. each. How much will he gain on 5½ lbs.?

$$5\tfrac{1}{2} \times \$0.50 = \$2.75 = \text{cost.}$$

$$5\tfrac{1}{2} \times 7000 = 38{,}500 = \text{number of grains in } 5\tfrac{1}{2} \text{ lbs.}$$

1 ℈ 5 grs. = 25 grs. = weight of each powder.

$$25\overline{)38500}$$

1540 = number of powders.

$1540 \times \$0.05 = \$77$ = price received.

$\$77 - \$2.75 = \$74.25$ = gain. *Ans.*

22. Find the entire surface of a block of marble 8 ft. long, 2 ft. wide, $1\frac{1}{2}$ ft. thick.

$2 \times 8 \times 2 = 32$ = square feet in top and bottom.
$2 \times 8 \times 1\frac{1}{2} = 24$ = square feet in two sides.
$2 \times 2 \times 1\frac{1}{2} = \underline{6}$ = square feet in two ends.
62 = square feet. *Ans.*

23. How many revolutions will be made by a wheel $3\frac{3}{4}$ yds. in circumference in passing over 198 mi.?

198 mi. = $198 \times 1760 = 348{,}480$ yds.

$$\frac{348480}{3\frac{3}{4}} = 92{,}928. \quad \textit{Ans.}$$

24. When an ounce of gold is worth \$16.25, what must be paid for $\frac{1}{25}$ of a pound?

$\frac{1}{25}$ lb. = $\frac{1}{25}$ of 12 oz. = $\frac{12}{25}$ oz. $\quad \frac{12}{\cancel{25}} \times \frac{\overset{0.65}{\$\cancel{16.25}}}{1} = \$7.80$. *Ans.*

25. If candles $8\frac{1}{2}$ in. long are worth 9 cts. a half-dozen, and candles $10\frac{1}{4}$ in. long are worth 11 cts. a half-dozen, which is the better kind to buy?

$6 \times 8\frac{1}{2}$ in. = 51 in. for 9 cts. = $\frac{17}{3}$ in. for 1 ct.
$6 \times 10\frac{1}{4}$ in. = $61\frac{1}{2}$ in. for 11 cts. = $\frac{123}{22}$ in. for 1 ct.
$\frac{17}{3} - \frac{123}{22} = \frac{374}{66} - \frac{369}{66} = \frac{5}{66}$. The $8\frac{1}{2}$ in. *Ans.*

26. How many silver spoons weighing 1 oz. 18 dwt. 12 grs. each can be made from 23 oz. 2 dwt. of silver?

$$\begin{array}{r l}
1 & \text{oz. 18 dwt. 12 oz.} \\
\underline{20} & \\
20 & \\
\underline{18} & \\
38 & \text{dwt.} \\
\underline{24} & \\
912 & \\
\underline{12} & \\
924 & \text{grs.}
\end{array}
\qquad
\begin{array}{r l}
23 & \text{oz. 2 dwt.} \\
\underline{20} & \\
460 & \\
\underline{2} & \\
462 & \text{dwt.} \\
\underline{24} & \\
11{,}088 & \text{grs.}
\end{array}$$

$$924\overline{)11088}$$
$$12 \quad \textit{Ans.}$$

27. An apprentice 14 yrs. 11 mos. 14 dys. old is to serve his employer until he is 21 yrs. of age. How long is he to stay with his employer?

21 yrs.	0 mos.	0 dys.
14	11	14
6	0	16

6 yrs. 16 dys. *Ans.*

28. What is the rate per hour of a horse that travels 18 mi. 1620 yds. in 3 hrs. 45 min.?

3 hrs. 45 min. = $3\frac{3}{4}$ hrs. = $\frac{15}{4}$ hrs.

18 mi. 1620 yds.
1760
31680
1620
33300 yds.

$$\frac{33300}{\frac{15}{4}} = \frac{4}{\cancel{15}} \times \frac{\overset{2220}{\cancel{33300}}}{1} = 8880.$$

$$8880 \text{ yds.} = \frac{8880}{1760} \text{ mi.} = 5\tfrac{1}{22} \text{ mi. } \textit{Ans.}$$

29. At 15 cts. a yard, what will be the cost of fencing a rectangular field 325 yds. long and 215 yds. wide?

2 × 325 yds. = 650 yds. length of sides.
2 × 215 yds. = 430 yds. length of ends.
1080 yds. total length.
0.15
162.00 $162. *Ans.*

30. What will be the width of carpeting, if 120 yds. are necessary to cover a floor 30 ft. long and $22\frac{1}{2}$ ft. wide?

$22\frac{1}{2}$ ft
30
9)675 sq. ft.
75 sq. yds.

$$\frac{75 \text{ sq. yds.}}{120 \text{ yds}} = \frac{5}{8} \text{ yd.} = 1\tfrac{7}{8} \text{ ft. } \textit{Ans.}$$

31. When the mercury in the tube of a barometer is 30 in. high, the pressure of the atmosphere is about 15 lbs. for every square inch. What will be its pressure when the mercury stands 25 in. high?

The pressure is $\frac{15}{30}$ lbs., $\frac{1}{2}$ lb. for each inch.
25 × $\frac{1}{2}$ lb. = $12\frac{1}{2}$ lbs. *Ans.*

32. A cistern containing 60 hhds. of water has two pipes open, by one of which 3 gals. of water per minute run in, and by the other 9 gals. run out. In how many hours will the cistern be emptied?

$9 \text{ gals.} - 3 \text{ gals.} = 6 \text{ gals.} =$ loss a minute.
$60 \text{ hhd.} = 60 \times 2 \times 31\frac{1}{2} = 3780 \text{ gals.}$
$\frac{3780}{6} = 630 =$ number of minutes required.
$630 \text{ min.} = \frac{630}{60} = 10\frac{1}{2}$ hrs. *Ans.*

33. How many pounds of cement will be required to plaster an open cistern whose dimensions are $4\frac{1}{2}$ ft. long, $3\frac{1}{3}$ ft. wide, and $2\frac{2}{3}$ ft. deep, if the cement on a square foot weighs $6\frac{3}{4}$ lbs.?

$4\frac{1}{2} \times 3\frac{1}{3} = 15$ = square feet in bottom.
$2 \times 4\frac{1}{2} \times 2\frac{2}{3} = 24$ = square feet in 2 sides.
$2 \times 3\frac{1}{3} \times 2\frac{2}{3} = \underline{17\frac{7}{9}}$ = square feet in 2 ends.
$56\frac{7}{9}$ = total sq. ft.

$56\frac{7}{9} \times 6\frac{3}{4} = 383\frac{1}{4}.$ $383\frac{1}{4}$ lbs. *Ans.*

34. How many tons of water will the cistern in example 33 hold, if a cubic foot of water weighs 1000 oz.?

$$4\frac{1}{2} \times 3\frac{1}{3} \times 2\frac{2}{3} = \frac{\overset{3}{\cancel{9}}}{\cancel{2}} \times \frac{10}{\cancel{3}} \times \frac{\overset{4}{\cancel{8}}}{\cancel{3}} = 40 = \text{number cu. ft.}$$

$$40 \times 1000 \text{ oz.} = 40{,}000 \text{ oz.} \qquad \begin{array}{r|l} 16 & 40000 \text{ oz.} \\ 2000 & 2500 \text{ lbs.} \\ & 1\frac{1}{4} \text{ t. } \textit{Ans.} \end{array}$$

35. What will be the cost of covering with paper $\frac{1}{2}$ yd. wide the four walls of a room 21 ft. long, 16 ft. wide, and 10 ft. high, if the cost of the paper is $12\frac{1}{2}$ cts. per yard, and no allowance is made for doors and windows?

$2 \times 21 \times 10 = 420$ = number of square feet in sides.
$2 \times 16 \times 10 = \underline{320}$ = number of square feet in ends.
$9\underline{)740}$ = total square feet.
$82\frac{2}{9}$ = total square yards.

$82\frac{2}{9} \times 2 = 164\frac{4}{9}$ = yards of $\frac{1}{2}$ yd. paper required.
$164\frac{4}{9} \times 0.12\frac{1}{2} = 20.56.$ $20.56. *Ans.*

36. What is the breadth of a rectangular field containing 7½ A., if the length is 242 yds.?

7½ A. = 7½ × 160 × 30¼ = 36,300 sq. yds.
242)36300 sq. yds.
150 yds. *Ans.*

37. A certain watch gains 3½ sec. in 24 hrs., and another loses 2½ sec. in the same time. If both be set right on Monday at noon, what will be the difference between them at 6 o'clock (true time) the next Saturday evening?

3½ sec. + 2½ sec. = 6 sec. = difference in 24 hrs.
Monday noon to 6 P.M. Saturday = 5 dys. 6 hrs. = 5¼ dys.
5¼ × 6 sec. = 31½ sec. *Ans.*

38. A milkman paid a farmer $3.20 for ten 2-gal. cans of milk. He lost 20 qts. At what price per quart must he retail the remainder to gain 8 cts. a gallon?

2 × 10 gals. = 20 gals. = 20 × 4 = 80 qts.
80 qts. − 20 qts. = 60 qts. = amount remaining.
$3.20 + 20 × $0.08 = $4.80 = amount to be received.
$\$\frac{4.80}{60} = \$0.08$ = price a quart. *Ans.*

39. A man who had ⅔ of a square mile of woodland sold 12½ sq. rds. How much had he left?

⅔ sq. mi. = ⅔ × 640 × 160 = 68,266⅔ sq. rds.
68,266⅔ sq. rds. − 12½ sq. rds. = 68,254⅙ sq. rds.
160)68254⅙ sq. rds.
426 A. 94⅙ sq. rds. *Ans.*

40. How many yards of Florence silk ⅝ yd. wide will be required to line 19 yds. of camel's hair cloth 1½ yds. wide?

19 × 1½ yds. = 28½ yds.

$$\frac{28\frac{1}{2}}{\frac{5}{8}}\text{ yds.} = \frac{57}{\cancel{2}} \times \frac{\overset{4}{\cancel{8}}}{5} = \frac{228}{5} = 45\tfrac{3}{5}\text{ yds. } \textit{Ans.}$$

41. How many days from Sept. 16, 1882, to Feb. 12, 1884?

1882 has left 106 dys.
1883 has 365
1884 has 43
514 dys. *Ans.*

42. A miller makes 154 bbls. of flour from $885\frac{1}{2}$ bu. of wheat. How many bushels on the average are required for a barrel of flour?

$\frac{885\frac{1}{2}}{154}$ bu. $= \frac{1771}{308} = 5\frac{3}{4}$ bu. $\frac{3}{4}$ bu. $= \frac{3}{4}$ of $4 = 3$ pks.
5 bu. 3 pks. *Ans.*

43. What must be the length of a walk $2\frac{1}{4}$ ft. wide to contain 38 sq. ft.?

$\frac{38}{2\frac{1}{4}} = \frac{4}{9} \times 38 = \frac{152}{9} = 16\frac{8}{9}$. $16\frac{8}{9}$ ft. *Ans.*

44. A cistern 7 ft. long and 5 ft. wide contains 105 cu. ft. What is its depth? how many gallons of water will it hold?

$7 \times 5 = 35$. $\frac{105}{35} = 3$. 3 ft. *Ans.*

$$\frac{\overset{5}{\cancel{105}} \times 1728}{\underset{11}{\cancel{231}}} = \frac{8640}{11} = 785\tfrac{5}{11} \text{ gals. } \textit{Ans.}$$

45. What must be paid for a pile of wood 25 ft. long, 3 ft. high, and 4 ft. wide at $5.50 per cord?

$$\frac{25 \times 3 \times \cancel{4}}{\underset{32}{\cancel{128}}} = \frac{75}{32} \text{ cds.} \qquad \tfrac{75}{32} \text{ of } \$5.50 = \$12.89. \ \textit{Ans.}$$

46. Each person on the average breathes 28 cu. ft. of air in an hour. How many hours will the air in a room 14 ft. long, 12 ft. wide, and 6 ft. high last 12 men?

$$\frac{\cancel{14} \times \cancel{12} \times \overset{3}{\cancel{6}}}{\underset{\cancel{2}}{\cancel{28}} \times \cancel{12}} = 3. \qquad 3 \text{ hrs. } \textit{Ans.}$$

47. Sound travels at the rate of 1130 feet a second. How long after the flash will the clap of thunder come when the cloud is 2 mi. 1000 yds. distant?

2 mi. 1000 yds. $= 2 \times 1760 + 1000 = 4520$ yds.
4520×3 ft. $= 13,560$ ft.
$\frac{13560}{1130} = 12$. 12 sec. *Ans.*

48. There are 9 oz. of iron in the blood of 1 man. How many men would furnish iron enough in their veins to make a ploughshare weighing $22\frac{1}{2}$ lbs.?

$22\frac{1}{2}$ lbs. $= 22\frac{1}{2} \times 16 = 360$ oz. $\quad \frac{360}{9} = 40$. *Ans.*

49. The fore wheel of a carriage is 4 ft. 7 in. in circumference, and the hind wheel 5 ft. 6 in. How many more times will the fore wheel turn than the hind wheel in going a distance of 1 mi.?

$$\begin{array}{r} 1 \text{ mi.} = 5280 \text{ ft.} \\ \underline{12} \\ 63{,}360 \text{ in.} \end{array}$$

4 ft. 7 in. = 55 in.

5 ft. 6 in. = 66 in.

$\frac{63360}{55} = 1152.$

$\frac{63360}{66} = 961.$

$1152 - 961 = 192.$ *Ans.*

50. A boarding-house uses 3 pks. of potatoes daily. At $87\frac{1}{2}$ cts. per bushel, what will be the expense for potatoes during October, November, and December?

$$\begin{array}{l} \text{Oct.} = 31 \text{ dys.} \\ \text{Nov.} = 30 \\ \text{Dec.} = \underline{31} \\ \qquad\quad 92 \text{ dys.} \end{array}$$

92×3 pks. $= 276$ pks.

276 pks. $= \frac{276}{4} = 69$ bu.

$69 \times \$0.87\frac{1}{2} = \$60.37\frac{1}{2}.$

$\$60.37\frac{1}{2}$. *Ans.*

Ex. 129. (*Oral.*) Page 205.

1. Find 4 % of 400 sheep.

$\frac{4}{100}$ of $400 = 16$. *Ans.*

2. Find 5 % of 1000 bricks.

$\frac{5}{100}$ of $1000 = 50$. *Ans.*

3. Find 8 % of 200 ft. of boards.

$\frac{8}{100}$ of $200 = 16$. *Ans.*

4. Find 6 % of 90 dys.

$\frac{6}{100}$ of $90 = 5.4$ *Ans.*

5. Find 10 % of 150 cds. of wood.

$\frac{10}{100}$ of $150 = 15$. *Ans.*

6. Find 20 % of 250 prs. of gloves.

$\frac{20}{100}$ of $250 = 50$. *Ans.*

7. Find 25 % of 120 horses.

$\frac{25}{100}$ of $120 = 30$. *Ans.*

8. Find 80 % of 400 A.

$\frac{80}{100}$ of $400 = 320$. *Ans.*

9. Find $6\frac{1}{4}$ % of 320 rds.

$\frac{6\frac{1}{4}}{100}$ of $320 = \frac{1}{16}$ of $320 = 20$. *Ans.*

10. Find $12\frac{1}{2}\%$ of 400 melons.

$\frac{12\frac{1}{2}}{100}$ of $400 = \frac{1}{8}$ of $400 = 50$. *Ans.*

11. Find $66\frac{2}{3}\%$ of 300 oranges.

$\frac{66\frac{2}{3}}{100}$ of $300 = \frac{2}{3}$ of $300 = 200$. *Ans.*

12. Find $8\frac{1}{3}\%$ of 1 doz. eggs.

$\frac{8\frac{1}{3}}{100}$ of $12 = \frac{1}{12}$ of $12 = 1$. *Ans.*

13. Find 75% of 40 hens.

$\frac{75}{100}$ of $40 = 30$. *Ans.*

14. Find 60% of 20 girls.

$\frac{60}{100}$ of $20 = 12$. *Ans.*

15. Find $16\frac{2}{3}\%$ of 60 lbs. of butter.

$\frac{16\frac{2}{3}}{100}$ of $60 = \frac{1}{6}$ of $60 = 10$. *Ans.*

16. Find $37\frac{1}{2}\%$ of 120 gals. of syrup.

$\frac{37\frac{1}{2}}{100}$ of $120 = \frac{3}{8}$ of $120 = 45$. *Ans.*

17. Find $62\frac{1}{2}\%$ of 800 soldiers.

$\frac{62\frac{1}{2}}{100}$ of $800 = \frac{5}{8}$ of $800 = 500$. *Ans.*

18. Find $\frac{4}{5}\%$ of 500 bu. of wheat.

$\frac{\frac{4}{5}}{100}$ of $500 = \frac{4}{500}$ of $500 = 4$. *Ans.*

19. Find $\frac{1}{2}\%$ of 4000 yds. of cloth.

$\frac{\frac{1}{2}}{100}$ of $4000 = \frac{1}{200}$ of $4000 = 20$. *Ans.*

20. Find $\frac{1}{5}\%$ of 100 dollars.

$\frac{\frac{1}{5}}{100}$ of \$100 $= \frac{1}{500}$ of \$100 = \$0.20. *Ans.*

Ex. 130. Page 205.

1. Find 9 % of 1297.

$$9\% \text{ of } 1297 = \tfrac{9}{100} \text{ of } 1297 = \frac{9 \times 1297}{100} = 116.73. \textit{ Ans.}$$

2. Find $2\frac{1}{2}\%$ of 4300.

$$2\tfrac{1}{2}\% \text{ of } 4300 = \frac{2\frac{1}{2} \times 4300}{100} = 107.5. \textit{ Ans.}$$

3. Find $\frac{1}{2}$ of 1 % of 1346.

$$\tfrac{1}{2} \text{ of } 1\% \text{ of } 1346 = \frac{\frac{1}{2} \times 1346}{100} = 6.73. \textit{ Ans.}$$

4. Find 12 % of 6072.

$$12\% \text{ of } 6072 = \frac{12 \times 6072}{100} = 728.64. \textit{ Ans.}$$

5. Find $\frac{1}{2}\%$ of 150,975.

$$\tfrac{1}{2}\% \text{ of } 150{,}975 = \frac{\frac{1}{2} \times 150{,}975}{100} = 754.875. \textit{ Ans.}$$

6. Find $1\frac{1}{10}\%$ of 1984.

$$1\tfrac{1}{10} \text{ of } 1984 = \frac{\frac{11}{10} \times 1984}{100} = 21.824. \textit{ Ans.}$$

7. Find 150% of 1050.

$$150\% \text{ of } 1050 = \frac{150 \times 1050}{100} = 1575. \textit{ Ans.}$$

8. Find 100% of 7968.

$$100\% \text{ of } 7968 = \frac{\cancel{100} \times 7968}{\cancel{100}} = 7968. \textit{ Ans.}$$

9. A farmer having a flock of 1200 sheep lost 37% of them. What per cent of them, and how many sheep, had he left?

$$100\% - 37\% = 63\%. \textit{ Ans.} \quad 63\% \text{ of } 1200 = \frac{63 \times \overset{12}{\cancel{1200}}}{\cancel{100}} = 756. \textit{ Ans.}$$

10. If copper ore yields 6% of pure metal, how many pounds of copper will be obtained from 1 t. of ore?

$$6\% \text{ of } 2000 \text{ lbs.} = \frac{6 \times \overset{20}{\cancel{2000}}}{\cancel{100}} = 120 \text{ lbs. } \textit{Ans.}$$

11. If a man buys 24 A. of land at $84 an acre, what must be the annual income that the investment may yield 10%?

$$24 \times \$84 = \$2016. \quad 10\% \text{ of } \$2016 = \frac{\cancel{10} \times 2016}{\underset{10}{\cancel{100}}} = \$201.60. \textit{ Ans.}$$

12. A grocer bought 40 cwt. of sugar for $240. 4% of it is wasted, and the remainder is retailed so there is neither loss nor gain. What is the retail price per pound?

40 cwt. = 4000 lbs.

$$4\% \text{ of } 4000 \text{ lbs.} = \frac{4 \times 4000}{100} \text{ lbs.} = 160 \text{ lbs.} = \text{loss.}$$

4000 lbs. − 160 lbs. = 3840 lbs. remaining.

$$\$\frac{\cancel{240}}{\cancel{3840}} = \$\frac{1}{16} = \$0.06\tfrac{1}{4}. \textit{ Ans.}$$

13. A stone-mason contracted to dig a cellar 45 ft. long, 36 ft. wide, and 6 ft. deep at 25 cts. a cubic yard. He lost 5% of his contract price. What was his loss?

$$\frac{\overset{5}{\cancel{45}} \times 36 \times \overset{2}{\cancel{6}}}{\underset{\cancel{3}}{\cancel{27}}} \text{ ft.} = 360 \text{ cu. yds.}$$

360 cu. yds. at \$0.25 = \$90.

$$5\% \text{ of } \$90 = \frac{5 \times 90}{100} = \$4.50. \textit{ Ans.}$$

14. A coal-dealer bought 25,784 t. of coal at \$5 a ton. He sold 40% of it at \$7, 20% at \$8.50, and the remainder at \$4.50. How much did he gain?

$$40\% + 20\% + 40\% = 100\%.$$

$$40\% \text{ of } 25784 \text{ t.} = \tfrac{2}{5} \text{ of } 25784 = 10313.6 \text{ t.}$$

$$20\% \text{ of } 25784 \text{ t.} = \tfrac{1}{5} \text{ of } 25784 = 5156.8 \text{ t.}$$

$$\begin{array}{rr} 10313.6 \times \$7 \quad = & \$72195.20 \\ 5156.8 \times \$8.50 = & 43832.80 \\ 10313.6 \times \$4.50 = & \underline{46411.20} \\ & \$162439.20 \end{array}$$

$$25784 \times \$5 = \$128920.$$

$$\begin{array}{r} \$162439.20 \\ \underline{128920.} \\ \$33519.20. \textit{ Ans.} \end{array}$$

15. A gentleman owns 2 farms. The first contains 360 A., and the number of acres in the second is 150% of the number of acres in the first. Find the number in the second farm.

$$150\% \text{ of } 360 \text{ A.} = \frac{\overset{15}{\cancel{150}} \times \overset{36}{\cancel{360}}}{\underset{\cancel{10}}{\cancel{100}}} \text{ A.} = 540 \text{ A. } \textit{Ans.}$$

Ex. 131. (*Oral.*) Page 206.

1. What per cent of 16 is 8?

$\frac{8}{16} = \frac{1}{2} = \frac{50}{100} = 50\%$. *Ans.*

2. What per cent of 20 is 5?

$\frac{5}{20} = \frac{1}{4} = 25\%$. *Ans.*

3. What per cent of 25 is 15?

$\frac{15}{25} = \frac{3}{5} = 60\%$. *Ans.*

4. What per cent of 48 is 8?

$\frac{8}{48} = \frac{1}{6} = 16\frac{2}{3}\%$. *Ans*

5. What per cent of 100 is $12\frac{1}{2}$?

$\frac{12\frac{1}{2}}{100} = \frac{25}{200} = \frac{1}{8} = 12\frac{1}{2}\%$. *Ans.*

6. What per cent of 2 is $\frac{1}{2}$?

$\frac{\frac{1}{2}}{2} = \frac{1}{4} = 25\%$. *Ans.*

7. What per cent of 3 is $\frac{2}{3}$?

$\frac{\frac{2}{3}}{3} = \frac{2}{9} = 22\frac{2}{9}\%$. *Ans.*

8. What per cent of $\frac{4}{9}$ is $\frac{2}{9}$?

$\frac{\frac{2}{9}}{\frac{4}{9}} = \frac{2}{4} = \frac{1}{2} = 50\%$. *Ans.*

9. What per cent of $72 are $18?

$\frac{18}{72} = \frac{1}{4} = 25\%$. *Ans.*

10. What per cent of $52 are $39?

$\frac{39}{52} = \frac{3}{4} = 75\%$. *Ans.*

11. What per cent of 50 qts. are 5 qts.?

$\frac{5}{50} = \frac{1}{10} = 10\%$. *Ans.*

12. What per cent of 66 gals. are 6 gals.?

$\frac{6}{66} = \frac{1}{11} = 9\frac{1}{11}\%$. *Ans.*

13. What per cent of 480 dys. are 24 dys.?

$\frac{24}{480} = \frac{1}{20} = 5\%$. *Ans.*

14. What per cent of 90 cds. are 9 cds.?

$\frac{9}{90} = \frac{1}{10} = 10\%$. *Ans.*

15. What per cent of 80 men are 50 men?

$\frac{50}{80} = \frac{5}{8} = 62\frac{1}{2}\%$. *Ans.*

Ex. 132. Page 207.

1. From a school of 150 scholars, 50 are absent. What per cent of the whole is the number present?

$150 - 50 = 100$ = number present.
$\frac{100}{150} = \frac{2}{3} = 0.66\frac{2}{3}$. $66\frac{2}{3}\%$. *Ans.*

2. In a school numbering 200 the daily average attendance is 160. What is the per cent of attendance? The number absent on the average is what per cent of the number present?

$\frac{160}{200} = \frac{4}{5} = 0.80$. 80%. *Ans.*
$200 - 160 = 40$.
$\frac{40}{160} = \frac{1}{4} = 0.25$. 25%. *Ans.*

3. A person bought a house and lot for $6000, paying $5000 for the house. The value of the lot is what per cent of the value of the house?

$\$6000 - \$5000 = \$1000$.
$\frac{1000}{5000} = \frac{1}{5} = 20\%$. *Ans.*

4. From a peck of corn a crop of $48\frac{1}{4}$ bu. was raised. What per cent was the increase?

$48\frac{1}{4}$ bu. $= 48\frac{1}{4} \times 4 = 193$ pks.
193 pks. $-$ 1 pk. = increase.
1 pk. = 100% of seed sown.
192 pks. $= 192 \times 100\% = 19200\%$.
19200%. *Ans.*

5. From 67½ bu. of corn, 6 bu. 3 pks. are sold. What per cent of the whole is sold?

6 bu. 3 pks. = 6¾ bu. = 6.75 bu.

$\frac{6.75}{67.5} = 0.10 = 10\%$. *Ans.*

6. A house worth $8000 rents for $720 a year. What per cent of its value does it rent for?

$\frac{720}{8000} = 0.09 = 9\%$. *Ans.*

7. From Delhi to Bombay the distance is 720 miles, and from Delhi to Madras 1080 miles. What per cent of the distance to Madras is the distance to Bombay?

$\frac{720}{1080} = \frac{2}{3} = 0.66\frac{2}{3}$. $66\frac{2}{3}\%$. *Ans.*

8. Westminster Hall is 270 ft. long and 75 ft. broad. What per cent of the length is the breadth?

$\frac{75}{270} = \frac{5}{18} = 0.27\frac{7}{9}$. $27\frac{7}{9}\%$. *Ans.*

9. The Peak of Teneriffe is 12,232 ft. high. What per cent of a mile is its height?

1 mi. = 5280 ft.

$\frac{12232}{5280}$ ft. $= \frac{139}{60} = 2.31\frac{2}{3}$.

$231\frac{2}{3}\%$. *Ans.*

10. The Danube is 1630 miles long, and the Missouri from its source to the Gulf of Mexico is 4000 miles long. What per cent of the length of the Missouri is the length of the Danube?

$\frac{1630}{4000} = 0.40\frac{3}{4}$. $40\frac{3}{4}\%$. *Ans.*

11. What per cent of 7 hrs. and 30 min. are 6¾ min.?

7½ hrs. = 7½ × 60 = 450 min.

$\frac{6.75}{450} = 0.01\frac{1}{2}$. $1\frac{1}{2}\%$. *Ans.*

12. What per cent of 3 wks. and 4 dys. are 3 dys. and 10½ hrs.?

$$\begin{array}{rl}
3 & \text{wks. } 4 \text{ dys.}\\
\underline{7} & \\
21 & \\
\underline{4} & \\
25 & \text{dys.}\\
\underline{24} & \\
600 & \text{hrs.}
\end{array}$$

$$\begin{array}{rl}
3 & \text{dys. } 10\tfrac{1}{2} \text{ hrs.}\\
\underline{24} & \\
72 & \\
\underline{10\tfrac{1}{2}} & \\
82\tfrac{1}{2} & \text{hrs.}
\end{array}$$

$\frac{82.5}{600} = 0.13\frac{3}{4}$. $13\frac{3}{4}\%$. *Ans.*

Ex. 133. (*Oral.*) Page 208.

1. What is the number of which 10 is 20%?

10 is 20%, or ⅕ of the number. Therefore the number is 50. *Ans.*

2. What is the number of which 3 is 10%?

3 is 10%, or $\frac{1}{10}$ of the number. Therefore the number is 30. *Ans.*

3. What is the number of which 8 is 25%?

8 is 25%, or $\frac{1}{4}$ of the number. Therefore the number is 32. *Ans.*

4. What is the number of which 4 is $6\frac{1}{4}$%?

4 is $6\frac{1}{4}$%, or $\frac{1}{16}$ of the number. Therefore the number is 64. *Ans.*

5. What is the number of which 5 is $8\frac{1}{3}$%?

5 is $8\frac{1}{3}$%, or $\frac{1}{12}$ of the number. Therefore the number is 60. *Ans.*

6. What is the number of which $\frac{1}{2}$ is $16\frac{2}{3}$%?

$\frac{1}{2}$ is $16\frac{2}{3}$%, or $\frac{1}{6}$ of the number. Therefore the number is 3. *Ans.*

7. What is the number of which $\frac{3}{4}$ is 50%?

$\frac{3}{4}$ is 50%, or $\frac{1}{2}$ of the number. Therefore the number is $1\frac{1}{2}$. *Ans.*

8. What is the number of which $\frac{3}{7}$ is 75%?

$\frac{3}{7}$ is 75%, or $\frac{3}{4}$ of the number. Therefore the number is $\frac{4}{7}$. *Ans.*

9. What is the number of which 60 is 60%?

60 is 60%, or $\frac{3}{5}$ of the number. Therefore the number is 100. *Ans.*

10. What is the number of which 50 is 40%?

50 is 40%, or $\frac{2}{5}$ of the number. Therefore the number is 125. *Ans.*

11. What is the number of which $\frac{7}{8}$ is 175%?

$\frac{7}{8}$ is 175%, or $\frac{7}{4}$ of the number. Therefore the number is $\frac{4}{8} = \frac{1}{2}$. *Ans.*

12. What is the number of which 17 is 34%?

17 is 34%, or $\frac{17}{50}$ of the number. Therefore the number is 50. *Ans.*

13. What is the number of which 50 is $62\frac{1}{2}$%?

50 is $62\frac{1}{2}$%, or $\frac{5}{8}$ of the number. Therefore the number is 80. *Ans.*

14. What is the number of which 300 is 0.3%?

300 is 0.3%, or $\frac{3}{1000}$ of the number. Therefore the number is 100,000. *Ans.*

15. What is the number of which 20 is $\frac{1}{5}$%?

20 is $\frac{1}{5}$%, or $\frac{1}{500}$ of the number. Therefore the number is 10,000. *Ans.*

Ex. 134. Page 208.

1. 10.08 is 16 % of what number?

$16\% = \frac{16}{100} = \frac{4}{25}$.

If $10.08 = \frac{4}{25}$ of the number, the number $= \frac{25 \times 10.08}{4} = 63$. *Ans.*

2. 24 is $7\frac{1}{2}\%$ of what number?

$7\frac{1}{2}\% = \frac{7.5}{100} = \frac{75}{1000} = \frac{3}{40}$.

If $24 = \frac{3}{40}$ of the number, the number $= \frac{40 \times \overset{8}{\cancel{24}}}{\cancel{3}} = 320$. *Ans.*

3. 10.94 is $\frac{4}{5}\%$ of what number?

$\frac{4}{5}\% = \frac{\frac{4}{5}}{100} = \frac{4}{500} = \frac{1}{125}$.

If $10.94 = \frac{1}{125}$ of the number, the number $= 125 \times 10.94 = 1367.50$. *Ans.*

4. 2500 is $12\frac{1}{2}\%$ of what number?

$12\frac{1}{2}\% = \frac{1}{8}$.

If $2500 = \frac{1}{8}$ of the number, the number $= 8 \times 2500 = 20{,}000$. *Ans.*

5. 960 is $33\frac{1}{3}\%$ of what number?

$33\frac{1}{3}\% = \frac{1}{3}$.

If $960 = \frac{1}{3}$ of the number, the number $= 3 \times 960 = 2880$. *Ans.*

6. 6000 is 20 % of what number?

$20\% = \frac{1}{5}$.

If $6000 = \frac{1}{5}$ of the number, the number $= 5 \times 6000 = 30{,}000$. *Ans.*

7. 990 is 110 % of what number?

$110\% = \frac{11}{10}$.

If $990 = \frac{11}{10}$ of the number, the number $= \frac{10 \times \overset{90}{\cancel{990}}}{\cancel{11}} = 900$. *Ans.*

8. 810 is 90 % of what number?

$90\% = \frac{9}{10}$.

If $810 = \frac{9}{10}$ of the number, the number $= \frac{10 \times \overset{90}{\cancel{810}}}{\cancel{9}} = 900$. *Ans.*

9. 980 is 175% of what number?

$175\% = \frac{7}{4}$.

If $980 = \frac{7}{4}$ of the number, the number $= \frac{4 \times \overset{140}{\cancel{980}}}{\cancel{7}} = 560$. *Ans.*

10. A city in 5 yrs. increased 12,000 in population, a gain of 25% What was the population at the beginning and end of the 5 yrs.?

$25\% = \frac{1}{4}$. If $12000 = \frac{1}{4}$ of population,
$4 \times 12000 = 48000$ = population at beginning of the 5 years.
$48000 + 12000 = 60000$ = population at the end of the 5 years.
48,000; 60,000. *Ans.*

11. A schoolboy in one week read 450 lines of Latin, which was 75% of the number in the book. How many lines had he still to read?

$75\% = \frac{3}{4}$. If $450 = \frac{3}{4}$ of book, the book $= \frac{4 \times \overset{150}{\cancel{450}}}{\cancel{3}} = 600$.
$600 - 450 = 150$ lines to read. *Ans.*

12. A boy sold chestnuts at $12\frac{1}{2}$ cts. a quart, which was 200% of their cost. What did they cost a bushel?

$32 \times 12\frac{1}{2}$ cts. = 400 cts. a bushel. $200\% = \frac{200}{100} = 2$.
If \$4.00 = 2 times the cost, the cost $= \$\frac{4.00}{2} = \$2.00$. *Ans.*

13. A clerk spent 60% of his salary for board, 20% of it for clothes, 11% for books, and saved \$117. What was his salary?

$60\% + 20\% + 11\% = 91\%$. $100\% - 91\% = 9\% = \frac{9}{100}$.
If $\$117 = \frac{9}{100}$ of salary, the salary $= \frac{100 \times \$\overset{13}{\cancel{117}}}{\cancel{9}} = \$1300$. *Ans*

14. At Christmas a lady gave her daughter an atlas worth \$27, and $\frac{2}{3}$ of the cost of the atlas was 90% of the sum paid for an engraving. What was the sum paid for the engraving?

$90\% = \frac{9}{10}$. $\frac{2}{3}$ of $\$27 = \$18$.
If $\$18 = \frac{9}{10}$ price of engraving, the price of engraving $= \$\frac{10 \times 18}{9}$ $= \$20$. *Ans.*

15. A sea-captain owning 60% of a vessel gave to his son 50% of his share, which was worth \$6000. What was the value of the vessel?

$50\% = \frac{1}{2}$; and $\frac{1}{2}$ of $60\% = 30\% = \frac{3}{10}$ son's share.

If $\$6000 = \frac{3}{10}$ value of vessel, the value of vessel $= \frac{10 \times \$6000}{3} = \$20,000$. *Ans.*

16. A gentleman worth \$50,000 gave 30% of his property to his son, and this gift was 80% of the property which the son already owned. Find the amount the son was worth after receiving his father's gift.

$30\% = \frac{3}{10}$; and $\frac{3}{10}$ of $\$50000 = \$15000$. $80\% = \frac{8}{10} = \frac{4}{5}$.

If $\$15000 = \frac{4}{5}$ of son's property before the gift, the son's property $= \frac{5 \times \$15000}{4} = \$18750$.

$\$15000 + \$18750 = \$33,750$ = whole of son's property. *Ans.*

Ex. 135. (*Oral.*) Page 209.

1. 36 is $12\frac{1}{2}\%$ more than what number?

If 36 is $12\frac{1}{2}\%$ more than the number, it is $112\frac{1}{2}\%$ or $\frac{9}{8}$ of the number. Hence the number is $36 \div \frac{9}{8} = \frac{8}{9}$ of $36 = 32$. *Ans.*

2. 65 is $6\frac{1}{4}\%$ less than what number?

If 65 is $6\frac{1}{4}\%$ less than the number, it is $93\frac{3}{4}\%$ or $\frac{15}{16}$ of the number. Hence the number is $65 \div \frac{15}{16} = \frac{16}{15}$ of $65 = 69\frac{1}{3}$. *Ans.*

3. 68 is $6\frac{1}{4}\%$ more than what number?

If 68 is $6\frac{1}{4}\%$ more than the number, it is $106\frac{1}{4}\%$ or $\frac{17}{16}$ of the number. Hence the number is $68 \div \frac{17}{16} = \frac{16}{17}$ of $68 = 64$. *Ans.*

4. 75 is $12\frac{1}{2}\%$ less than what number?

If 75 is $12\frac{1}{2}\%$ less than the number, it is $87\frac{1}{2}\%$ or $\frac{7}{8}$ of the number. Hence the number is $75 \div \frac{7}{8} = \frac{8}{7}$ of $75 = 85\frac{5}{7}$. *Ans.*

5. By selling a hat for \$5.40, I sell it for 20% more than the cost. What was the cost?

If \$5.40 is 20% more than the cost, it is 120% or $\frac{6}{5}$ of the cost. Hence the cost is $\$5.40 \div \frac{6}{5} = \frac{5}{6}$ of $\$5.40 = \$4.50$. *Ans.*

6. A manufacturer sells mowing-machines at \$125 apiece, and gains 40%. What do they cost?

If he gains 40% he gets 140% or $\frac{7}{5}$ of the cost. Hence the cost is \$125 $\div \frac{7}{5} = \frac{5}{7}$ of \$125 = \$89.28$\frac{4}{7}$. *Ans.*

7. Sold a carriage for \$240, which was 20% more than the cost. What was the cost?

If \$240 is 20% more than the cost, it is 120% or $\frac{6}{5}$ of the cost. Hence the cost is \$240 $\div \frac{6}{5} = \frac{5}{6}$ of \$240 = \$200. *Ans.*

8. 64 is 33$\frac{1}{3}$% more than what number?

If 64 is 33$\frac{1}{3}$% more than the number, it is 133$\frac{1}{3}$% or $\frac{4}{3}$ of the number. Hence the number is $64 \div \frac{4}{3} = \frac{3}{4}$ of 64 = 48. *Ans.*

9. What number diminished by 5% of itself equals 190?

100% – 5% = 95%. Hence 190 is 95% of the number, and the number is $190 \div \frac{95}{100} = \frac{100}{95}$ of 190 = 200. *Ans.*

10. What number diminished by 10% of itself equals 180?

100% – 10% = 90%. Hence 180 is 90% of the number, and the number is $180 \div \frac{90}{100} = \frac{100}{90}$ of 180 = 200. *Ans.*

Ex. 136. Page 210.

1. 874 is 33$\frac{1}{3}$% less than what number?

33$\frac{1}{3}$% = $\frac{1}{3}$; $\frac{3}{3} - \frac{1}{3} = \frac{2}{3}$.
If 874 = $\frac{2}{3}$ of the number, the number = $\frac{3 \times 874}{2}$ = 1311. *Ans.*

2. 1740 is 20% more than what number?

20% = $\frac{1}{5}$.
If 1740 = $\frac{6}{5}$ of the number, the number = $\frac{5 \times 1740}{6}$ = 1450. *Ans.*

3. 40% of 4000 is 20% less than what number?

40% = $\frac{2}{5}$ and $\frac{2}{5}$ of 4000 = 1600. 100% – 20% = 80% = $\frac{4}{5}$.
If 1600 = $\frac{4}{5}$ of the number, the number = $\frac{5 \times 1600}{4}$ = 2000. *Ans.*

4. What number diminished by 15% of the number equals 5100?

100% – 15% = 85% = $\frac{17}{20}$.
If 5100 = $\frac{17}{20}$ of the number, the number = $\frac{20 \times 5100}{17}$ = 6000. *Ans.*

5. What fraction increased by 25% of itself equals $\frac{15}{16}$?

$100\% + 25\% = 125\% = \frac{5}{4}$.

If $\frac{15}{16} = \frac{5}{4}$ of required fraction, the required fraction $= \dfrac{\cancel{4} \times \overset{3}{\cancel{15}}}{\cancel{5} \times \underset{4}{\cancel{16}}} = \dfrac{3}{4}$. *Ans.*

6. 7500 is $33\frac{1}{3}\%$ less than what number?

$100\% - 33\frac{1}{3}\% = 66\frac{2}{3} = \frac{2}{3}$.

If $7500 = \frac{2}{3}$ of the number, the number $= \dfrac{3 \times 7500}{2} = 11{,}250$. *Ans.*

7. A drover sold 250 sheep for \$1150, which was 15% more than they cost. Find the cost of the sheep per head.

$100\% + 15\% = 115\% = \frac{115}{100} = \frac{23}{20}$.

If \$1150 $= \frac{23}{20}$ of the cost, the cost $= \$\dfrac{20 \times \overset{50}{\cancel{1150}}}{\cancel{23}} = \$1000$.

Cost per head $= \$\frac{1000}{250} = \$4$. *Ans.*

8. At a forced sale, a bankrupt sold his house for \$8000, which was 20% less than its real value. If the house had been sold for \$12,000, what per cent above its real value would it have brought?

$100\% - 20\% = 80\% = \frac{4}{5}$.

If \$8000 $= \frac{4}{5}$ of the value, the value $= \$\dfrac{5 \times 8000}{4} = \$10000$.

\$12000 − \$10000 = \$2000. $\frac{2000}{10000} = \frac{1}{5} = 20\%$. *Ans.*

9. A flock of sheep has been increased by 250% of its number, and now numbers 1050. What was the original number?

100% = original number in flock.
$100\% + 250\% = 350\%$ = flock and increase.
$350\% = \frac{350}{100} = \frac{7}{2}$.
If $1050 = \frac{7}{2}$ of the original number in flock, then the original number

$= \dfrac{2 \times \overset{150}{\cancel{1050}}}{\cancel{7}} = 300$. *Ans.*

10. If 20% be lost on a ton of rye-straw sold for \$19.20, what is the cost of the straw?

$100\% - 20\% = 80\% = \frac{4}{5}$.

If \$19.20 $= \frac{4}{5}$ of cost, cost $= \$\dfrac{5 \times 19.20}{4} = \$24$. *Ans.*

Ex. 137. Page 211.

1. A horse which cost \$80 was sold for \$60. Find the actual loss and the loss per cent.

$\$80 - \$60 = \$20$. *Ans.* $\frac{20}{80} = \frac{1}{4} = 25\%$. *Ans.*

2. Flour that cost \$10 per barrel was sold for \$12 per barrel. Find the gain per cent.

$\$12 - \$10 = \$2$. $\frac{2}{10} = \frac{1}{5} = 20\%$. *Ans.*

3. If milk is bought at 4 cts. a quart, and sold at 6 cts., what is the gain per cent?

6 cts. – 4 cts. = 2 cts. $\frac{2}{4} = \frac{1}{2} = 50\%$. *Ans.*

4. Goods that cost \$40 were sold at 20% below cost. What was the actual loss?

$20\% = \frac{1}{5}$. $\frac{1}{5}$ of $\$40 = \$8$. *Ans.*

5. Velvet is sold for \$3.75 per yard, at a gain of 25%. Find the cost of the velvet.

$100\% + 25\% = 125\% = \frac{5}{4}$.

If $\$3.75 = \frac{5}{4}$ of cost, the cost $= \$\frac{4 \times \overset{0.75}{\cancel{3.75}}}{\cancel{5}} = \$3$. *Ans.*

6. By selling cloth at \$1.60 a yard, a merchant loses 20%. What is the cost?

$100\% - 20\% = 80\% = \frac{4}{5}$.

If $\$1.60 = \frac{4}{5}$ of cost, the cost $= \$\frac{5 \times \overset{0.40}{\cancel{1.60}}}{\cancel{4}} = \$2$. *Ans.*

7. Five cords of wood costing \$20 were sold at \$7 per cord. What was the gain per cent?

$5 \times \$7 = \$35$. Gain $= \$35 - \$20 = \$15$. $\frac{15}{20} = \frac{3}{4} = 75\%$. *Ans.*

8. A carpenter paid \$5000 for a house; spent in repairs a sum equal to 80% of the purchase-price; and then sold the house for \$12,000. How much did he gain, and what per cent of the whole cost?

$80\% = \frac{4}{5}$. $\frac{4}{5}$ of $\$5000 = \$4000$, cost of repairs.
$\$5000 + \$4000 = \$9000$, whole cost.
$\$12000 - \$9000 = \$3000$ gain. *Ans.*
$\frac{3000}{9000} = \frac{1}{3} = 33\frac{1}{3}\%$. *Ans.*

9. In selling 32 yds. of cloth, a merchant made \$6.40, which was 16% of the cost. What did the cloth cost a yard?

$16\% = \frac{4}{25}$. If \$6.40 $= \frac{4}{25}$ of the cost, the cost $= \$\frac{25 \times \overset{1.60}{\cancel{6.40}}}{\cancel{4}} = \$40$.

Cost per yard $= \$\frac{40}{32} = \$1.25$. *Ans.*

10. Goods were sold for \$1615.12½, at a gain of 9½%. What did they cost?

$109\frac{1}{2}\% = \frac{109.5}{100}$.

If $\$1615.125 = \frac{109.5}{100}$ of the cost, the cost $= \$\frac{100 \times 1615.125}{109.5} = \$1475$. *Ans.*

11. If tea sold at 84 cts. a pound gives a profit of 20%, what would be the profit per cent if it were sold at 75 cts. a pound?

$120\% = \frac{6}{5}$.

If 84 cts. $= \frac{6}{5}$ of the cost, the cost $= \frac{5 \times 84 \text{ cts.}}{6} = 70$ cts.

Profit = 75 cts. − 70 cts. = 5 cts. $\frac{5}{70} = \frac{1}{14} = 7\frac{1}{7}\%$. *Ans.*

12. A trader's profits were \$1980 in the year 1880. This sum was 20% more than his profits in 1881. Find his profits in 1881.

$120\% = \frac{6}{5}$.

If \$1980 $= \frac{6}{5}$ of profits in 1881, the profits in 1881 $= \$\frac{5 \times \overset{330}{\cancel{1980}}}{\cancel{6}} = \$1650$. *Ans.*

13. A cord of wood costing \$4.50 sold for \$9. What was the gain per cent?

\$9.00 − \$4.50 = \$4.50, gain. $\frac{4.50}{4.50} = 1 = 100\%$. *Ans.*

14. A house-lot was sold for \$1850, at an advance of 15% on its cost. What would have been the gain per cent if it had been sold for \$2210?

$115\% = \frac{23}{20}$.

If \$1850 $= \frac{23}{20}$ of the cost, the cost $= \$\frac{20 \times 1850}{23} = \$1608\frac{16}{23}$.

$\$2210 - \$1608\frac{16}{23} = \$601\frac{7}{23}$ = profit.

$\frac{601\frac{7}{23}}{1608\frac{16}{23}} = \frac{13830}{\cancel{23}} \times \frac{\cancel{23}}{37000} = \frac{13830}{37000} = 0.37\frac{14}{37}$. $37\frac{14}{37}\%$. *Ans.*

15. A manufacturer owning $\frac{4}{5}$ of a factory sold $12\frac{1}{2}\%$ of his share, at 10% above cost, for \$1100. What is the cost of the factory?

$12\frac{1}{2}\% = \frac{1}{8}$; $110\% = \frac{11}{10}$. $\frac{1}{\underset{2}{\cancel{8}}} \text{ of } \frac{\cancel{4}}{5} = \frac{1}{10}$ = part of factory sold.

If \$1100 = $\frac{11}{10}$ of cost of part sold, the cost of part sold $= \$\frac{10 \times 1100}{11}$ = \$1000.

If $\frac{1}{10}$ of factory is worth \$1000, the whole factory is worth

$10 \times \$1000 = \$10{,}000$. *Ans.*

16. What per cent is made in buying coal by the long ton, at \$5 a ton, and selling it by the short ton, at the same price?

2240 lbs. − 2000 lbs. = 240 lbs. $\frac{240}{2000} = \frac{12}{100} = 12\%$. *Ans.*

17. Corn cultivated at an expense of 28 cts. a bushel is sold at 1 ct. a pound. What is the gain per cent?

If corn is sold at 1 ct. a pound, it is sold for 56 cts. a bushel.
56 cts. − 28 cts. = 28 cts. $\frac{28}{28} = 1 = 100\%$. *Ans.*

18. What per cent advantage is there in buying opium by the pound avoirdupois, and selling it by the pound apothecaries' weight?

1 lb. avoirdupois = 7000 grs. 7000 grs. − 5760 grs. = 1240 grs.
1 lb. apothecaries' = 5760 grs. $\frac{1240}{5760} = \frac{31}{144} = 0.21\frac{19}{36}$. $21\frac{19}{36}\%$. *Ans.*

19. A grocer lost 5% in selling a 50-lb. tub of butter for \$15.20. What did the butter cost per pound?

$5\% = \frac{1}{20}$. If $\$15.20 = \frac{19}{20}$ of cost, the cost $= \$\frac{20 \times 15.20}{19} = \$16$.
Cost per pound $= \$16 \div 50 = \$0.32$. *Ans.*

20. Ten cows were sold for \$690, at a gain of 15%. For how much per head, on the average, should they have been sold to gain 20%?

$115\% = \frac{23}{20}$. If $\$690 = \frac{23}{20}$ of cost, the cost $= \$\frac{20 \times \overset{30}{\cancel{690}}}{\cancel{23}} = \$600$.

$100\% + 20\% = 120\% = \frac{6}{5}$, and $\frac{6}{5}$ of \$600 = \$720 selling price.
Selling price of each $= \$720 \div 10 = \$72$. *Ans.*

21. For what price per dozen must gloves be bought in order that, by selling them at \$1.75 per pair, there may be a gain of 25%?

$12 \times \$1.75 = \$21$ selling price a dozen. $125\% = \frac{5}{4}$.
If \$21 is $\frac{5}{4}$ of cost, the cost $= \$\frac{4 \times 21}{5} = \$16.80$. *Ans.*

22. A merchant lost 25% by selling flour at \$6 per barrel. If he had sold it at \$9 per barrel, what would have been the gain per cent?

$75\% = \frac{3}{4}$. If \$6 is $\frac{3}{4}$ of cost, the cost $= \$\frac{4 \times \overset{2}{\cancel{6}}}{\cancel{3}} = \$8$.
$\$9 - \$8 = \$1$, gain. $\frac{1}{8} = \frac{12\frac{1}{2}}{100} = 12\frac{1}{2}\%$. *Ans.*

23. A fruit-grower sent to New York 300 peck baskets of peaches, valued at 75 cts. each. Sixty baskets were spoiled on the journey. At what rate per basket must he sell the remainder to make 20% profit on the entire value of his fruit?

$300 \times \$0.75 = \$225$, value of fruit. $300 - 60 = 240$ baskets saved.
$20\% = \frac{1}{5}$; $\frac{1}{5}$ of $\$225 = \$45$. $\$225 + \$45 = \$270$, selling price.
Selling price per basket equals $\$\frac{270}{240} = \$1\frac{1}{8} = \$1.12\frac{1}{2}$. *Ans.*

24. Sold goods at a loss of 20%, and actual loss of \$57.50. What was the first cost?

$20\% = \frac{1}{5}$.
If $\$57.50 = \frac{1}{5}$ of cost, the cost $= 5 \times \$57.50 = \$287.50$. *Ans.*

25. Find the selling-price of goods by which there is a loss of 2% and an actual loss of \$54.50.

$2\% = \frac{1}{50}$.
If \$54.50 is $\frac{1}{50}$ of cost, the cost $= 50 \times \$54.50 = \$2725$.
$\$2725 - \$54.50 = \$2670.50$, selling price. *Ans.*

26. How many pounds of cheese bought at 9 cts. a pound must be sold at 12 cts. a pound to gain \$30?

12 cts. − 9 cts. = 3 cts. $\frac{30}{0.03} = 1000$. *Ans.*

27. Sold steel at $25.44 a ton with a profit of 6% and a total profit of $103.32. What quantity was sold?

$106\% = \frac{53}{50}$.

If $\$25.44 = \frac{53}{50}$ of cost, the cost $= \$\frac{50 \times \overset{0.48}{\cancel{25.44}}}{\cancel{53}} = \$24$.

$\$25.44 - \$24 = \$1.44$, profit per ton.

If the profit per ton was $1.44, and the total profit was $103.32, there were as many tons sold as $\$103.32 \div \$1.44 = 71\frac{3}{4}$. $71\frac{3}{4}$ t. *Ans.*

Ex. 138. Page 215.

1. A commission-merchant sold 90 bbls. of flour at $6 a barrel, and received 5% commission. What was his commission?

$5\% = \frac{1}{20}$. $90 \times \$6 = \$540$, value of flour.

Commission $= \frac{1}{20}$ of $\$540 = \$27$. *Ans.*

2. A commission of $121.29 was charged for selling $1866 worth of goods. What was the rate of commission?

$$\frac{121.29}{1866} = \frac{0.195}{3} = 0.065. \qquad 6\tfrac{1}{2}\%. \ \textit{Ans.}$$

3. A grain-dealer charged 7% commission for selling a quantity of wheat, and received for his commission $109.20. What was the total amount received for the wheat?

$7\% = \frac{7}{100}$.

If $\$109.20 = \frac{7}{100}$ of the amount, the amount $= \$\frac{100 \times \overset{15.60}{\cancel{109.20}}}{\cancel{7}} = \$1560$. *Ans.*

4. A real-estate broker sold a house on $6\frac{1}{4}\%$ commission, and sent to the owner as net proceeds $3060. What was the broker's commission, and what sum was received for the house?

Broker received $6\frac{1}{4}\% = \frac{1}{16}$; owner received $93\frac{3}{4}\% = \frac{15}{16}$.

If $\$3060$ is $\frac{15}{16}$ of sale, the sale $= \$\frac{16 \times \overset{204}{\cancel{3060}}}{\cancel{15}} = \$3264$.

$\$3264 - \$3060 = \$204$, the commission. $204; $3264. *Ans.*

5. A New York merchant sent $1295.32 to New Orleans to be expended in cotton. The broker in New Orleans charged 6% commission. What sum was paid for cotton?

Commission on \$1 = \$0.06.
Hence on every \$1.06 sent, there is paid for cotton \$1.
That is, $\frac{100}{106}$ of money sent is paid for cotton.
$\frac{100}{106}$ of \$1295.32 = \$1222. *Ans.*

6. If \$5125 include the amount expended for wool and $2\frac{1}{2}\%$ commission to the purchasing agent, how much money does the agent lay out in wool?

Commission on \$1 = \$0.025.
Hence out of every \$1.025, there is paid for wool \$1.
That is, $\frac{1000}{1025}$ of the money is paid for wool.
$\frac{1000}{1025}$ of \$5125 = \$5000. *Ans.*

7. A lawyer collected 75 % of a debt of \$1260, and charged 5 % commission on the sum collected. What did the creditor receive?

75 % = $\frac{3}{4}$. $\frac{3}{4}$ of \$1260 = \$945, sum collected.
5 % = $\frac{1}{20}$. $\frac{1}{20}$ of \$945 = \$47.25, commission.
\$945 − \$47.25 = \$897.75, amount received by creditor. *Ans.*

8. An agent sold 420 bu. of corn at 60 cts. a bushel, and the commission was \$7.56. What rate of commission was charged for selling?

420 × \$0.60 = \$252. $\frac{7.56}{252} = 0.03 = 3\%$. *Ans.*

9. A land agent charged 4 % for selling 750 A. of land at \$20 an acre. What was his commission?

4 % = $\frac{1}{25}$. 750 A. at \$20 = \$15000. $\frac{1}{25}$ of \$15000 = \$600. *Ans.*

10. How many yards of cloth, at 45 cts. a yard, can an agent buy with the commission received from the sale of 180 bu. of potatoes at 50 cts. a bushel, his rate of commission for selling the potatoes being $1\frac{1}{2}\%$?

$1\frac{1}{2}\% = \frac{3}{200}$. 180 bu. at 50 cts. = \$90. $\frac{3}{200}$ of \$90 = \$1.35, commission.
For \$1.35 as many yards at \$0.45 can be bought as

\$1.35 ÷ \$0.45 = 3. *Ans.*

11. A man bought a horse for $225, which sum was half of his commission, at 2½%, on the sale of a farm. What did the farm bring?

$2\frac{1}{2}\% = \frac{5}{200} = \frac{1}{40}$. $2 \times \$225 = \$450$, commission.
If $450 is $\frac{1}{40}$ of price of farm, the price of farm $= 40 \times \$450 = \$18,000$. *Ans.*

12. A young man selling tea on 2¾% commission sent to his employer $875.25 as the net proceeds of one week's sales. What did the average daily sales amount to?

$2\frac{3}{4}\% = \frac{11}{400}$. $97\frac{1}{4}\% = \frac{389}{400}$.
If $875.25 is $\frac{389}{400}$ of sales, the sales $= \$\frac{400 \times 875.25}{389} = \$900$.
Sale for one day $= \$900 \div 6 = \$150$. *Ans.*

13. A St. Louis merchant received $150 as his commission, at 2½% for purchasing 1200 bbls. of flour. What was the price paid per barrel?

$2\frac{1}{2}\% = \frac{1}{40}$.
If $150 is $\frac{1}{40}$ of the sum, the sum $= 40 \times \$150 = \$6000$.
If $6000 was paid for 1200 bbls., there was paid for one bbl.
$\$6000 \div 1200 = \$5$. *Ans.*

14. A broker sold for a farmer 12,000 lbs. of pork, at 8⅓ cts. per pound. He charged 3% commission for selling, and paid $37.60 for freight. How many feet of pine boards, at $25 per M., can the broker buy with the net proceeds, if he charges 1% commission for buying?

$12000 \times 8\frac{1}{3}$ cts. $= \$1000$.
$\frac{3}{100}$ of $\$1000 = \$30$, commission.
$\$30 + \$37.60 = \$67.60$, expense.
$\$1000 - \$67.60 = \$932.40$.
$\frac{100}{101}$ of $\$932.40 = \$923.17$.
$\$923.17 \div \$25 = 36.927$.
36.927 M. = 36,927 ft. *Ans.*

15. A broker is offered a commission of 5½% for selling wool and guaranteeing payment, or a commission of 3¾% without guaranteeing payment. He accepts the 5½% commission, and guarantees the payment. The sales amount to $8500, and the bad debts to $147.75. How much did he gain by his choice?

$5\frac{1}{2}\% = \frac{11}{200}$; $3\frac{3}{4}\% = \frac{3}{80}$.
$\frac{11}{200}$ of $\$8500 = \$467.50$, his actual commission.
$\$467.50 - \$147.75 = \$319.75$, commission minus debts.
$\frac{3}{80}$ of $\$8500 = \$318.75$, commission without guaranteeing payment.
$\$319.75 - \$318.75 = \$1$, gain by his choice. *Ans.*

Ex. 139. Page 218.

1. Find the cost of insuring property worth $15,000, if $\frac{2}{3}$ of the value is insured at $\frac{4}{5}\%$.

$\frac{2}{3}$ of \$15000 = \$10000, value insured.

$\frac{4}{5}\% = \frac{\frac{4}{5}}{100} = \frac{4}{500} = \frac{1}{125}.$

$\frac{1}{125}$ of \$10000 = \$80. *Ans.*

2. Find the cost of insuring $\frac{5}{6}$ of the value of 6000 bbls. of flour worth $9.60 a barrel, the insurance being reckoned at $\frac{1}{2}\%$.

6000 × \$9.60 = \$57600. $\frac{1}{2}\% = \frac{1}{200}.$

$\frac{5}{6}$ of \$57600 = \$48000. $\frac{1}{200}$ of \$48000 = \$240. *Ans.*

3. A stock of goods worth $12,000 was insured for $\frac{7}{8}$ of its value at $\frac{3}{4}\%$. If the whole stock were burned, what would be the loss to the owner, including the premium paid for insurance?

$\frac{3}{4}\% = \frac{\frac{3}{4}}{100} = \frac{3}{400}.$

$\frac{7}{8}$ of \$12000 = \$10500, value insured.

$\frac{3}{400}$ of \$10500 = \$78.75, premium.

\$12000 + \$78.75 = \$12078.75, value of stock and premium.

\$12078.75 – \$10,500 = \$1578.75, loss. *Ans.*

4. After three annual payments of $337.50, premium at $1\frac{1}{2}\%$ on $\frac{3}{4}$ of the value of a mill, it was burned. Find the loss to the insurance company.

$1\frac{1}{2}\% = \frac{1\frac{1}{2}}{100} = \frac{3}{200}.$

If \$337.50 = $\frac{3}{200}$ of insurance, insurance = \$ $\frac{200 \times 337.50}{3}$ = \$22500.

3 × \$337.50 = \$1012.50, payments.

\$22500 – \$1012.50 = \$21,487.50, loss. *Ans.*

5. At $\frac{4}{5}\%$, how much insurance can be effected upon a store for $108?

$\frac{4}{5}\% = \frac{\frac{4}{5}}{100} = \frac{1}{125}.$

If \$108 = $\frac{1}{125}$ of insurance, insurance = 125 × \$108 = \$13,500. *Ans.*

6. What annual premium at $1\frac{1}{3}\%$ must be paid on a life-insurance of $6000?

$1\frac{1}{3}\% = \frac{1\frac{1}{3}}{100} = \frac{1}{75}$. $\frac{1}{75}$ of \$6000 = \$80. *Ans.*

7. At the rate of \$17 upon \$1000, what annual premium will be paid on a life-insurance of \$6700?

\$6700 is 6.7 times \$1000. 6.7 × \$17 = \$113.90. *Ans.*

8. The annual premium paid for life-insurance at $1\frac{3}{4}\%$ is \$70. What is the sum insured?

$1\frac{3}{4}\% = \frac{1\frac{3}{4}}{100} = \frac{7}{400}$.

If \$70 = $\frac{7}{400}$ of the sum insured, sum insured = $\$\frac{400 \times \overset{10}{\cancel{70}}}{\cancel{7}} = \$4000$. *Ans.*

9. For what sum should a cargo worth \$74,496 be insured, at 3%, so that, in case of loss, the owner may recover both the value of the cargo and the premium paid?

Premium on \$1 at 3% is \$0.03.
Insurance on \$0.97 worth of cargo = \$1.
Hence insurance on \$74496 worth of cargo = $\$\frac{74496}{0.97} = \$76,800$. *Ans.*

Ex. 140. Page 219.

1. If the assessed valuation of a town is \$784,750, and the town has 260 polls, paying \$1.25 each, what is the rate when the tax levy is \$16,020 besides the estimated amount to be received from the state?

Poll taxes = 260 × \$1.25 = \$325.
Tax on property = \$16020 − \$325 = \$15695.
$\frac{15695}{784750} = \frac{2}{100} = 2\%$. *Ans.*

2. A district schoolhouse is to cost \$3500, and the property of the district is assessed at \$210,000. What is the rate, and what tax must be paid on property assessed at \$3798.60?

$\frac{3500}{210000} = 0.01\frac{2}{3} = 1\frac{2}{3}\%$. *Ans.*
$1\frac{2}{3}\% = \frac{1}{60}$.
$\frac{1}{60}$ of \$3798.60 = \$63.31. *Ans.*

3. In a city of 2000 polls, each paying \$1.50, the sum of \$111,000 is to be raised by taxation on property assessed at \$9,000,000. What is the tax of a man who pays for 4 polls, and tax on property assessed at \$25,670?

Poll taxes $= 2000 \times \$1.50 = \$3000$.
Tax on property $= \$111000 - \$3000 = \$108000$.
$\frac{108000}{9000000} = \frac{36}{3000} = 0.012 = 1\frac{1}{5}\% =$ rate.
$1\frac{1}{5}\%$ of \$25670 = \$308.04, his property tax.
4 polls at \$1.50 = \$6.
\$308.04 + \$6 = \$314.04, whole tax. *Ans.*

4. What is the rate of taxation when \$710.92 is the tax upon \$50,780?

$$\frac{710.92}{50780} = 0.014 = 0.01\frac{2}{5} = 1\frac{2}{5}\%. \text{ Ans.}$$

5. If a tax of \$12,350 is to be raised, and the collector receives 5% for collecting the taxes, what sum must be levied?

$100\% - 5\% = 95\% = \frac{19}{20}$.
If $\$12350 = \frac{19}{20}$ of sum to be levied,
the sum to be levied $= \$\frac{20 \times \overset{650}{\cancel{12350}}}{\cancel{19}} = \$13,000$. *Ans.*

6. A town-hall is to be built at a cost of \$11,400. What sum must be assessed if the collector receives 5% for collecting the taxes, and what will be the rate if the assessed valuation of the town is \$800,000?

$100\% - 5\% = 95\% = \frac{19}{20}$.
If $\$11400 = \frac{19}{20}$ of sum to be levied,
the sum to be levied $= \$\frac{20 \times \overset{600}{\cancel{11400}}}{\cancel{19}} = \$12,000$. *Ans.*
$\frac{12000}{800000} = \frac{3}{200} = \frac{1\frac{1}{2}}{100} = 1\frac{1}{2}\%$. *Ans.*

7. Find the duty, at 15%, on 95 cases of indigo, each weighing 190 lbs., and invoiced at 75 cts. per pound.

$15\% = \frac{3}{20}$.
95 × 190 lbs. = 18050 lbs.
18050 × \$0.75 = \$13537.50, value of indigo.
Duty $= \frac{3}{20}$ of \$13537.50 = $\$2030.62\frac{1}{2}$. *Ans.*

8. After deducting 20% for leakage, what will be the duty on 40 hhds. of molasses, of 84 gals. each, if the molasses is invoiced at 90 cts. a gallon, and the duty is 30%?

20% = $\frac{1}{5}$; 30% = $\frac{3}{10}$.
40 × 84 gals. = 3360 gals.
$\frac{1}{5}$ of 3360 gals. = 672 gals., leakage.
3360 gals. − 672 gals. = 2688 gals., left.
2688 × $0.90 = $2419.20.
Duty = $\frac{3}{10}$ of $2419.20 = $725.76. *Ans.*

9. On 15 doz. bottles of sherry wine there is paid $1.25 per dozen for transportation, and $1.50 per dozen for duty. What is the whole cost of importation?

15 × $1.25 = $18.75 for transportation.
15 × $1.50 = 22.50 for duty.
$41.25 whole cost. *Ans.*

10. A Boston merchant received from Paris:

325 yds. of silk @ $2.25 a yard;
296 yds. of lace @ 1.50 a yard;
480 yds. of ribbon @ 0.50 a yard;
45 doz. gloves @ 15.00 a doz.

If the duty on silk, ribbon, and lace is 35%, and on gloves 25%, what is the whole amount of the duties?

325 × $ 2.25 = $731.25, @ 35% = $255.94
296 × 1.50 = 444, @ 35% = 155.40
480 × 0.50 = 240, @ 35% = 84.00
45 × 15.00 = 675, @ 25% = 168.75
$664.09 *Ans.*

11. If the duty is $2.50 a gallon on cologne water, what must be paid on 75 doz. pint bottles, if there is an allowance of 5% for breakage?

5% = $\frac{1}{20}$.
75 doz. pts. = 900 pts.

2 | 900 pts.
4 | 450 qts.
112.5 gals.

$\frac{1}{20}$ of 112.5 gals. = 5.625 gals., breakage.
112.5 gals. − 5.625 gals. = 106.875 gals., left.
Duty = 106.875 × $2.50 = $267.19. *Ans.*

12. What is the invoice cost of goods upon which $625 duty is paid, if the duty is reckoned at 25%?

$25\% = \frac{1}{4}$.

If $625 = $\frac{1}{4}$ of cost, the cost = 4 × $625 = $2500. *Ans.*

13. What will be paid by a grocer importing 120 chests of tea, containing 79 lbs. each, invoiced at 75 cts. per pound, if the duty is 15%?

$15\% = \frac{3}{20}$.

120 × 79 lbs. = 9480 lbs.

9480 × $0.75 = $7110, value of tea.

Duty = $\frac{3}{20}$ of $7110 = $1066.50. *Ans.*

Ex. 141. Page 221.

1. Of what number is 450 nine per cent?

$9\% = \frac{9}{100}$.

If 450 = $\frac{9}{100}$ of the number, the number = $\frac{100 \times \overset{50}{\cancel{450}}}{\cancel{9}} = 5000$. *Ans.*

2. What is the excess of 5% of 1500 over $\frac{1}{2}\%$ of 7000?

$5\% = \frac{1}{20}$.

$\frac{1}{2}\% = \frac{\frac{1}{2}}{100} = \frac{1}{200}$

$\frac{1}{20}$ of 1500 = 75.

$\frac{1}{200}$ of 7000 = 35.

75 − 35 = 40. *Ans.*

3. What per cent of 9000 is 45?

$\frac{45}{9000} = \frac{1}{200} = \frac{1}{2}\%$. *Ans.*

4. Five hundred and sixty is 12% more than what number?

$100\% + 12\% = 112\% = \frac{112}{100} = \frac{28}{25}$.

If 560 = $\frac{28}{25}$ of the number, the number = $\frac{25 \times \overset{20}{\cancel{560}}}{\cancel{28}} = 500$. *Ans.*

5. Seven hundred and fifty-two is 6% less than what number?

$100\% - 6\% = 94\% = \frac{94}{100} = \frac{47}{50}$.

If 752 = $\frac{47}{50}$ of the number, the number = $\frac{50 \times \overset{16}{\cancel{752}}}{\cancel{47}} = 800$. *Ans.*

6. There is a difference of 893 between a certain number and 6% of the number. Find the number.

$6\% = \frac{3}{50}$.

If 893 = $\frac{47}{50}$ of the number, the number = $\frac{50 \times \overset{19}{\cancel{893}}}{\cancel{47}} = 950$. *Ans.*

7. What per cent of 25 lbs. are 3 lbs. 4 oz.?

25×16 oz. $= 400$ oz.
3×16 oz. $= 48$ oz.; 48 oz. $+$ 4 oz. $= 52$ oz.
$\frac{52}{400} = \frac{13}{100} = 13\%$. *Ans.*

8. The difference between $50\frac{1}{2}\%$ and $75\frac{1}{4}\%$ of a number is 99. Find the number. Let the example be proved.

$75\frac{1}{4}\% - 50\frac{1}{2}\% = 24\frac{3}{4}\%$.

$$24\frac{3}{4}\% = \frac{24\frac{3}{4}}{100} = \frac{99}{400}.$$

If $99 = \frac{99}{400}$ of the number, the

$$\text{number} = \frac{400 \times \cancel{99}}{\cancel{99}} = 400. \textit{ Ans.}$$

Proof.

$$50\frac{1}{2}\% = \frac{50\frac{1}{2}}{100} = \frac{101}{200}.$$

$$75\frac{1}{4}\% = \frac{75\frac{1}{4}}{100} = \frac{301}{400}.$$

$\frac{101}{200}$ of $400 = 202$.
$\frac{301}{400}$ of $400 = 301$.
$301 - 202 = 99$.

9. A merchant sold cloth at \$4.20 per yard, and gained 20%. If it had been sold at \$3.60, what actual gain, and what gain per cent, would have been made?

$120\% = \frac{6}{5}$.

If \$4.20 $= \frac{6}{5}$ of cost, the cost $= \$\frac{5 \times \overset{0.70}{\cancel{4.20}}}{\cancel{6}} = \$3.50$.

\$3.60 $-$ \$3.50 $=$ \$0.10, actual gain. *Ans.*

$\frac{10}{350} = \frac{2\frac{6}{7}}{100} = 2\frac{6}{7}\%$, gain per cent. *Ans.*

10. By how much does $\frac{6}{7}\%$ exceed $\frac{4}{5}\%$?

$\frac{6}{7}\% - \frac{4}{5}\% = \frac{30}{35}\% - \frac{28}{35}\% = \frac{2}{35}\%$. *Ans.*

11. At an average price of 55 cts. per bushel, and a charge of $2\frac{1}{2}\%$ commission, how many bushels of grain can be bought for \$4510?

$$2\frac{1}{2}\% = \frac{2\frac{1}{2}}{100} = \frac{1}{40}.$$

$\frac{1}{40}$ of \$0.55 $=$ \$0.01$\frac{3}{8}$, commission on 1 bu.
\$0.55 $+$ \$0.01$\frac{3}{8}$ $=$ \$0.56$\frac{3}{8}$, cost of 1 bu.
For \$4510 as many bushels can be bought at \$0.56$\frac{3}{8}$ as
\$4510 $\div$ \$0.56$\frac{3}{8}$ $= 8000$. *Ans.*

12. A landau was sold for $488, at a gain of 22%. Required the cost.

$100\% + 22\% = 122\% = \frac{122}{100} = \frac{61}{50}$.

If $\$488 = \frac{61}{50}$ of the cost, the cost $= \$\frac{50 \times \overset{8}{\cancel{488}}}{\cancel{61}} = \$400$. *Ans.*

13. A milkman's gallon measure was too small by ½ gi. What was the rate per cent of fraudulent gain?

1 gal. = 64 half gills.
1 half gill gain.
63 half gills milk.
½ gill gain in 63 half gills milk is $\frac{1}{63}$ gain $= 1\frac{37}{63}\%$. *Ans.*

14. A merchant paid $112.50 for 75 yds. of silk, of which 15 yds. were worthless. At what price per yard must the remainder be sold to gain 20% on the purchase-price of the whole?

$20\% = \frac{1}{5}$. $\frac{1}{5}$ of $112.50 = $22.50 gain.
$112.50 + $22.50 = $135, selling price.
75 yds. − 15 yds. = 60 yds., number to be sold.
If 60 yards are to be sold for $135, one yard must be sold for $\$\frac{135}{60} = \$2.25$. *Ans.*

15. For selling goods, an agent received $106.83 commission, 2¼% for selling, 2¾% for guaranteeing payment. What sum was received for the goods?

$2\frac{1}{4}\% + 2\frac{3}{4}\% = 5\% = \frac{1}{20}$.
If $\$106.83 = \frac{1}{20}$ of the price, the price = 20 × $106.83 = $2136.60. *Ans.*

16. A dealer bought 70 bags of wool at $32 a bag; 10% of it proved unsalable. For what price per bag must he sell the rest to realize 15% on his purchase?

$10\% = \frac{1}{10}$; $15\% = \frac{3}{20}$.
70 × $32 = $2240, cost.
$\frac{3}{\cancel{20}}$ of $\$\overset{112}{\cancel{2240}} = \$336$, gain.
$2240 + $336 = $2576, selling price.
$\frac{1}{10}$ of 70 = 7, number of bags unsalable.
70 − 7 = 63, number of bags to be sold.

If 63 bags are to be sold for $2576, one bag will be sold for $\$\frac{2576}{63} = \$40\frac{8}{9} = \$40.89$. *Ans.*

17. [illegible] brokerage, rate ⅛% [illegible]

[illegible]

[illegible] investment = 300 × $9.375 [illegible]

18. [illegible] cwt. were sold, which was 75⅓% of [illegible]

[illegible] cwt. = [illegible] cwt.

[illegible] the stock = $\frac{300 \times 226}{226}$ cwt. = 300 cwt. [illegible]

19. [illegible] $250 was bought for $50 less and sold for $25 [illegible] What was the rate of gain on the price paid?

$250 − $50 = $200 price paid. $275 − $200 = $75 gain.
$250 + $25 = $275 selling price. $\frac{75}{200}$ = ⅜ = .37½ = 37½% *Ans.*

20. A man left 30% of his estate to his wife, 50% of the remainder to his son, 75% of the residue to his daughter and the balance, $546, to a family servant. Required the value of the estate.

If wife had 30%, 70% was left.
If son had 50%, or ½ of remainder, 35% was left.
If daughter had 75%, or ¾ of the residue, ¼ of 35% was left = 8¾%.
8¾% = $\frac{35}{400}$ = $\frac{7}{80}$
If $546 = $\frac{7}{80}$ of the estate, the estate = $$\frac{80 \times \overset{78}{\cancel{546}}}{\cancel{7}}$ = $6240. *Ans.*

21. What per cent of $\frac{9}{11}$ is $\frac{3}{22}$? of $\frac{7}{13}$ is $\frac{14}{39}$?

$\frac{\frac{3}{22}}{\frac{9}{11}} = \frac{\cancel{3}}{\underset{2}{\cancel{22}}} \times \frac{\cancel{11}}{\underset{3}{\cancel{9}}} = \frac{1}{6} = 16\frac{2}{3}\%$ *Ans.* $\frac{\frac{14}{39}}{\frac{7}{13}} = \frac{\overset{2}{\cancel{14}}}{\underset{3}{\cancel{39}}} \times \frac{\cancel{13}}{\cancel{7}} = \frac{2}{3} = 66\frac{2}{3}\%$ *Ans*

22. A man sold 36 horses for $200 each: on half of them he gained 20%, and on half he lost 10%. What was his gain per cent on the whole sale?

$120\% = \frac{6}{5}$; $10\% = \frac{1}{10}$. $18 \times \$200 = \$3600$.

If $3600 = $\frac{6}{5}$ of cost of one half, the cost of one half $= \$\frac{5 \times \cancel{3600}^{600}}{\cancel{6}} = \$3000$.

If $3600 = $\frac{9}{10}$ of cost of other half, the cost of other half $= \$\frac{10 \times \cancel{3600}^{400}}{\cancel{9}}$ $= \$4000$.

$\$3000 + \$4000 = \$7000$, total cost.
$\$3600 - \$3000 = \$600$, gain on one half.
$\$4000 - \$3600 = \$400$, loss on other half.
$\$600 - \$400 = \$200$, net gain.
$\frac{200}{7000} = \frac{1}{35} = 0.02\frac{6}{7} = 2\frac{6}{7}\%$. *Ans.*

23. A gentleman sent to a broker $1281.25 to be invested in land at $62.50 an acre. A commission of $2\frac{1}{2}\%$ being charged for buying, how many acres were bought?

$102\frac{1}{2}\% = \frac{102\frac{1}{2}}{100} = \frac{41}{40}$.

If $1281.25 = $\frac{41}{40}$ of investment, the investment $= \$\frac{40 \times \cancel{1281.25}^{31.25}}{\cancel{41}}$ $= \$1250$.

For $1250 as many acres at $62.50 can be bought as
$\$1250 \div \$62.50 = 20$. *Ans.*

24. The dimensions 10, 8, and 6, of a rectangular bin being increased 10%, what will be the rate per cent of increase in capacity?

$10\% = \frac{1}{10}$.

The dimensions when increased will be $10 + \frac{1}{10}$ of 10, $8 + \frac{1}{10}$ of 8, $6 + \frac{1}{10}$ of $6 = 11, 8.8, 6.6$, respectively.

$10 \times 8 \times 6 = 480$, capacity at first.
$11 \times 8.8 \times 6.6 = 638.88$, capacity when increased.
$638.88 - 480 = 158.88$, increase of capacity.
$\frac{158.88}{480} = 0.33\frac{1}{10} = 33\frac{1}{10}\%$. *Ans.*

25. One-half of a stock of goods valued at $612.60 was sold for $\frac{2}{3}$ of the value of the whole stock. What was the gain per cent?

$\frac{1}{2}$ of $612.60 = $306.30, value of goods sold.
$\frac{2}{3}$ of $612.60 = $408.40, selling price.
$\$408.40 - \$306.30 = \$102.10$, gain.
$\frac{102.10}{306.30} = \frac{1}{3} = 33\frac{1}{3}\%$. *Ans.*

26. A roll of 140 yds. of carpet was sold for $72, at a loss of 10%. What should it have brought per yard to insure a gain of 15%?

$10\% = \frac{1}{10}$; $15\% = \frac{3}{20}$.
If $72 = $\frac{9}{10}$ of the cost, the cost = $$\frac{10 \times \overset{8}{\cancel{72}}}{\cancel{9}}$ = $80.

$\frac{3}{20}$ of $80 = $12, gain of 15%.
$80 + $12 = $92, selling price.
If 140 yds. are sold for $92, one yard is sold for $92 ÷ 140 = 0.65\frac{5}{7}$. *Ans.*

27. A railroad company with $9,000,000 capital declares a dividend of $360,000. What sum will be received on 120 shares of $100 each?

$$\text{Rate} = \frac{\overset{4}{\cancel{360000}}}{\underset{100}{\cancel{9000000}}} = \frac{4}{100} = 4\%.$$

4% = $4 a share. 120 × $4 = $480. *Ans.*

28. Ten per cent of a roll of carpet having been sold to one man, 10% of the remainder to another, 30.375 yds. are left. How many yards were there at first?

If 10% is sold 90% remains.
If 10% of the remainder is sold, 9% is sold, and 81% remains.
$81\% = \frac{81}{100}$.
If 30.375 yds. = $\frac{81}{100}$ of whole number,

$$\text{the whole number} = \frac{100 \times \overset{0.375}{\cancel{30.375}}}{\cancel{81}} \text{ yds.} = 37.5 \text{ yds. } \textit{Ans.}$$

29. At an annual premium of $405, rate $1\frac{1}{2}\%$, $\frac{3}{4}$ of the value of a mill is insured. What is the entire value of the mill?

$1\frac{1}{2}\% = \frac{1\frac{1}{2}}{100} = \frac{3}{200}$.

If $405 = $\frac{3}{200}$ of $\frac{3}{4}$ of the mill, $\frac{3}{4}$ of the mill = $$\frac{200 \times \overset{135}{\cancel{405}}}{\cancel{3}}$ = $27,000.

If $27,000 = $\frac{3}{4}$ of whole mill, the whole mill = $$\frac{4 \times \overset{9000}{\cancel{27000}}}{\cancel{3}}$ = $36,000. *Ans.*

30. A broker buying cotton at $\frac{3}{4}\%$ commission retained \$75 for his commission, and paid \$25 for storage. What sum was sent by his employers to cover the whole expense of investment?

$\frac{3}{4}\% = \frac{3}{400}$.

If $\$75 = \frac{3}{400}$ of investment, the investment $= \$\frac{400 \times \overset{25}{\cancel{75}}}{\cancel{3}} = \$10{,}000$.

$\$10000 + \$75 + \$25 = \$10{,}100$. *Ans.*

32. A merchant placed 80% of his year's profits in a bank; after he had drawn out 20% of this deposit, \$2880 remained. What were his profits for the year?

$20\% = \frac{1}{5}$. If $\frac{1}{5}$ of deposit was drawn out, $\frac{4}{5}$ remained.

$\frac{4}{5}$ of 80% of profits = 64% of profits. $64\% = \frac{64}{100} = \frac{16}{25}$.

If $\$2880 = \frac{16}{25}$ of profits, the profits $= \$\frac{25 \times \overset{180}{\cancel{2880}}}{\cancel{16}} = \$4500$. *Ans.*

33. Required the tax-rate, in a city appropriating for public expenses \$147,000, to be assessed on property worth \$35,000,000.

$\frac{147000}{35000000} = \frac{21}{5000} = 0.0042$.

That is, on every \$1000, the tax is $\$4\frac{1}{5}$. *Ans.*

34. A lady bought a house for \$7965, which rented for \$841.85. The taxes were \$50; repairs, \$75. What rate per cent did the investment yield?

\$50 + \$75 = \$125, expenses.

\$841.25 − \$125 = \$716.25, yield.

$\frac{716.25}{7965} = \frac{5.31}{59} = 0.09 = 9\%$. *Ans.*

35. A premium of \$960 was paid for full insurance on a ship and cargo, at $1\frac{1}{2}\%$. The cost of the cargo was 60% of the cost of the ship. What was the value of each?

$1\frac{1}{2}\% = \frac{3}{200}$.

If $\$960 = \frac{3}{200}$ of value of ship and cargo, the value of ship and cargo $= \$\frac{200 \times \overset{320}{\cancel{960}}}{\cancel{3}} = \$64{,}000$.

If value of cargo = 60% of ship, value of ship and cargo $= \frac{160}{100}$, or $\frac{8}{5}$ of value of ship.

If \$64,000 = $\frac{8}{5}$ of value of ship, the value of ship = \$$\frac{5 \times \overset{8000}{\cancel{64000}}}{\cancel{8}}$ = 40,000. *Ans.*

Value of cargo = \$64,000 − \$40,000 = \$24,000. *Ans.*

36. Find the entire cost of 4000 bbls. of flour purchased by an agent, at \$7 a barrel, who charged 3% commission, and paid \$315 for freight.

4000 × \$7 = \$28,000, paid for flour.
$\frac{3}{100}$ of \$28,000 = \$840, commission.
\$28,000 + \$840 + \$315 = \$29,155. *Ans.*

37. How many barrels of flour can be bought for \$5924.38 by an agent who pays \$7 a barrel for the flour, charges 3% commission, and pays \$315 for the freight?

$\frac{3}{100}$ of \$7 = \$0.21, commission on 1 bbl.
\$7 + \$0.21 = \$7.21, cost of 1 bbl. with commission.
\$5924.38 − \$315 = \$5609.38.
For \$5609.38, as many barrels can be bought at \$7.21 a barrel, as \$5609.38 ÷ \$7.21 = 778. *Ans.*

38. The insurance on $\frac{2}{3}$ the value of a hotel and furniture cost \$300. The rate being 75 cts. on \$100, what was the value of the property?

$\frac{75}{10000} = \frac{3}{400}$.
If \$300 = $\frac{3}{400}$ of $\frac{2}{3}$ of value of hotel, $\frac{2}{3}$ value of hotel = \$$\frac{400 \times 300}{3}$ = \$40,000.
If \$40,000 = $\frac{2}{3}$ of value of hotel, the value of hotel = \$$\frac{3 \times 40000}{2}$ = \$60,000. *Ans.*

39. What is the duty, at 25¾ cts. per gallon, on 48 bbls. of turpentine, 31 gals. making a barrel, and 5% being allowed for leakage?

48 × 31 gals. = 1488 gals.
$\frac{5}{100}$ of 1488 gals. = 74.4 gals., leakage.
1488 gals. − 74.4 gals. = 1413.6 gals.
1413.6 × \$0.25¾ = \$364.002. *Ans.*

Ex. 142. Page 227.

1. Find the interest of $51.25 for 30 dys., at 6%.

Interest of $51.25 for 60 days at 6% = $0.5125.
For 30 days = ½ of $0.5125 = $0.25625. $0.26. *Ans.*

2. Find the interest of $2581 for 60 dys., at 6%.

Interest of $2581 for 60 days at 6% = $25.81. *Ans.*

3. Find the interest of $1261 for 90 dys., at 6%.

Interest of $1261 for 60 days at 6% = $12.61.
For 90 days = $12.61 + ½ of $12.61 = $18.91. *Ans.*

4. Find the interest of $1250.60 for 4 mos., at 6%.

Interest of $1250.60 for 60 days or 2 mos. at 6% = $12.506.
For 4 mos. = 2 × $12.506 = $25.012. $25.01. *Ans.*

5. Find the interest of $3020 for 3 mos., at 6%.

Interest of $3020 for 2 mos., at 6% = $30.20.
For 3 mos. = $30.20 + ½ of $30.20 = $45.30. *Ans.*

6. Find the interest of $2300 for 3 mos., at 6%.

Interest of $2300 for 2 mos. at 6% = $23.00.
For 3 mos. = $23 + ½ of $23 = $34.50. *Ans.*

7. Find the interest of $275 for 2 mos. at 6%.

Interest of $275 for 2 mos. at 6% = $2.75. *Ans.*

8. Find the interest of $5000 for 1 mo., at 6%.

Interest of $5000 for 2 mos. at 6% = $50.00.
For 1 mo. = ½ of $50 = $25. *Ans.*

9. Find the interest of $1361 for 2 yrs., at 5%.

Interest of $1361 for 2 yrs. at 5% = 2 × 0.05 × $1361 = $136.10. *Ans.*

10. Find the interest of $675.90 for 5 yrs., at 3½%.

3½% = 0.035.
Interest of $675.90 for 5 yrs. at 3½% = 5 × 0.035 × $675.90 = $118.2825.
$118.28. *Ans.*

[illegible] mos. at [illegible] %

[illegible]

[illegible] $= [illegible] \times$ $775.83

[illegible]

[illegible] mos. at [illegible] %

[illegible]

[illegible] $= \frac{1}{3}$ of [illegible] $\times$ $333.33⅓ = $20.

Ans.

[illegible] mos. at [illegible] %

[illegible]

[illegible] $= [illegible] \times$ $250.60

[illegible]

[illegible] mos. 15 dys., at 5%

[illegible]

[illegible]

[illegible] of the principal.

[illegible]

[illegible] same time at [illegible] $=$ [illegible] of $54.735 = $53.99. *Ans.*

[illegible] mos. [illegible] dys. at 4½%

[illegible]

[illegible] $=$ [illegible]

[illegible] $=$ [illegible]

[illegible] $=$ [illegible]045

[illegible] of the principal.

[illegible]

[illegible] same time at [illegible] $= \frac{3}{4}$ of $136.42 = $102.32. *Ans.*

[illegible] mos. [illegible] dys., at 5½%

[illegible]

[illegible] mos. [illegible] $=$ [illegible]25

[illegible] dys. [illegible] $=$ [illegible].0045

[illegible] mos. [illegible] dys. $=$ [illegible]295 of the principal.

And 0.0295 of \$725.40 = \$21.399.

Interest of \$725.40 for same time at $5\frac{1}{4}\% = \frac{5\frac{1}{4}}{6}$ of \$21.399 = $\frac{7}{8}$ of \$21.399 = \$18.72. *Ans.*

17. Find the interest of \$547.60 from Feb. 20 to Dec. 5, at $3\frac{1}{4}\%$.

mos.	dys.
12	5
2	20
9	15

Interest at 6% for

9 mos. = 9 × 0.005 = 0.045
15 dys. = $15 \times \frac{1}{6}$ of 0.001 = 0.0025
9 mos. 15 dys. = 0.0475 of the principal.

And 0.0475 of \$547.60 = \$26.01.

Interest of \$547.60 for same time at $3\frac{1}{4}\% = \frac{3\frac{1}{4}}{6}$ of \$26.01 = $\frac{13}{24}$ of \$26.01 = \$14.09. *Ans.*

18. Find the interest of \$1750 from May 5, 1884, to June 21, 1885, at $5\frac{1}{2}\%$.

yrs.	mos.	dys.
1885	6	21
1884	5	5
1	1	16

Interest at 6% for

1 yr. = 0.06
1 mo. = 0.005
16 dys. = $16 \times \frac{1}{6}$ of 0.001 = $0.002\frac{2}{3}$
1 yr. 1 mo. 16 dys. = $0.067\frac{2}{3}$ of the principal.

And $0.067\frac{2}{3}$ of \$1750 = \$118.42.

Interest of \$1750 for same time at $5\frac{1}{2}\% = \frac{5\frac{1}{2}}{6}$ of \$118.42 = $\frac{11}{12}$ of \$118.42 = \$108.55. *Ans.*

19. Find the interest of \$1517 from Jan. 5 to July 1, at $4\frac{1}{2}\%$.

mos.	dys.
7	1
1	5
5	26

Interest at 6 % for

5 mos. = 5 × 0.005 = 0.025
26 dys. = 26 × $\frac{1}{6}$ of 0.001 = 0.004$\frac{1}{3}$
5 mos. 26 dys. = 0.029$\frac{1}{3}$ of the principal.

And 0.029$\frac{1}{3}$ of $1517 = $44.498.

Interest of $1517 for same time at 4$\frac{1}{2}$ % = $\frac{3}{4}$ of $44.498 = $33.37. *Ans.*

20. Find the interest of $476.50 from July 5, 1884, to Feb. 9, 1885, at 4 %.

yrs.	mos.	dys.
1885	2	9
1884	7	5
	7	4

Interest at 6 % for

7 mos. = 7 × 0.005 = 0.035
4 dys. = 4 × $\frac{1}{6}$ of 0.001 = 0.0006$\frac{2}{3}$
7 mos. 4 dys. = 0.0356$\frac{2}{3}$ of the principal.

And 0.0356$\frac{2}{3}$ of $476.50 = $17.

Interest of $476.50 for same time at 4 % = $\frac{2}{3}$ of $17 = $11.33. *Ans.*

21. Find the interest of $319.20 from April 7 to Aug. 31, at 3$\frac{1}{4}$ %.

mos.	dys.
8	31
4	7
4	24

Interest at 6 % for

4 mos. = 4 × 0.005 = 0.02
24 dys. = 24 × $\frac{1}{6}$ of 0.001 = 0.004
4 mos. 24 dys. = 0.024 of the principal.

And 0.024 of $319.20 = $7.66.

Interest of $319.20 for same time at 3$\frac{1}{4}$ % = $\frac{3\frac{1}{4}}{6}$ of $7.66 = $\frac{13}{24}$ of $7.66 = $4.15. *Ans.*

22. Find the interest of $6460 from June 15, 1883, to May 7, 1885, at 4$\frac{1}{4}$ %.

yrs.	mos.	dys.
1885	5	7
1883	6	15
1	10	22

Interest at 6% for

1 yr. = 0.06
10 mos. = 10 × 0.005 = 0.05
22 dys. = 22 × $\frac{1}{6}$ of 0.001 = 0.003$\frac{2}{3}$

1 yr. 10 mos. 22 dys. = 0.113$\frac{2}{3}$ of the principal.

And 0.113$\frac{2}{3}$ of $6460 = $734.29.

Interest of $6460 for same time at 4$\frac{1}{4}$% = $\frac{4\frac{1}{4}}{6}$ of $734.29 = $\frac{17}{24}$ of $734.29 = $520.12. *Ans.*

23. Find the interest of $150 from Aug. 5, 1883, to March 17, 1885, at 7%.

yrs.	mos.	dys.
1885	3	17
1883	8	5
1	7	12

Interest at 6% for

1 yr. = 0.06
7 mos. = 7 × 0.005 = 0.035
12 dys. = 12 × $\frac{1}{6}$ of 0.001 = 0.002

1 yr. 7 mos. 12 dys. = 0.097 of the principal.

And 0.097 of $150 = $14.55.
Interest of $150 for same time at 7% = $\frac{7}{6}$ of $14.55 = $16.98. *Ans.*

24. Find the interest of $527.20 from Jan. 1 to Nov. 20, at 4$\frac{1}{2}$%.

mos.	dys.
11	20
1	1
10	19

Interest at 6% for

10 mos. = 10 × 0.005 = 0.05
19 dys. = 19 × $\frac{1}{6}$ of 0.001 = 0.003$\frac{1}{6}$

10 mos. 19 dys. = 0.053$\frac{1}{6}$ of the principal.

And 0.053$\frac{1}{6}$ of $527.20 = $28.03.
Interest of $527.20 for same time at 4$\frac{1}{2}$% = $\frac{3}{4}$ of $28.03 = $21.02. *Ans.*

25. Find the interest of $1250 from Nov. 15, 1884, to March 1, 1885, at 5%.

yrs.	mos.	dys.
1885	3	1
1884	11	15
	3	16

Interest at 6% for

3 mos. $= 3 \times 0.005 = 0.015$
16 dys. $= 16 \times \frac{1}{6}$ of $0.001 = 0.002\frac{2}{3}$
3 mos. 16 dys. $= 0.017\frac{2}{3}$ of the principal.

And $0.017\frac{2}{3}$ of $1250 = $22.08.
Interest of $1250 for same time at 5% $= \frac{5}{6}$ of $22.08 = $18.40. *Ans.*

26. Find the interest of $624.36 from March 5 to Dec. 20, at $7\frac{3}{10}$%.

mos.	dys.
12	20
3	5
9	15

Interest at 6% for

9 mos. $= 9 \times 0.005 = 0.045$
15 dys. $= 15 \times \frac{1}{6}$ of $0.001 = 0.0025$
9 mos. 15 dys. $= 0.0475$ of the principal.

And 0.0475 of $624.36 = $29.66.
Interest of $624.36 for same time at $7\frac{3}{10}\% = \frac{7.3}{6}$ of $29.66 = $36.08. *Ans.*

27. Find the amount of $1100 for 3 yrs. 4 mos., at 5%.

3 yrs. 4 mos. $= 3\frac{1}{3}$ yrs.; 5% = 0.05.
Interest of $1100 for 3 yrs. 4 mos. at 5% $= 3\frac{1}{3} \times 0.05 \times$ $1100 = $$183.33\frac{1}{3}$.
Amount = $1100 + $183.33 = $1283.33. *Ans.*

28. Find the amount of $1290.50 for 60 dys., at 6%.

Interest of $1290.50 for 60 dys. at 6% = $12.905.
Amount = $1290.50 + $12.91 = $1303.41. *Ans.*

29. Find the amount of $1275 for 3 yrs. 2 mos. 15 dys., at 8%.

Interest at 6% for

3 yrs. = $3 \times 0.6 = 0.18$
2 mos. = $2 \times 0.005 = 0.01$
15 dys. = $15 \times \frac{1}{6}$ of $0.001 = 0.0025$
3 yrs. 2 mos. 15 dys. = 0.1925 of the principal.

And 0.1925 of $1275 = $245.44.

Interest on $1275 for same time at 8% = $\frac{4}{3}$ of $245.44 = $327.25.

Amount = $1275 + $327.25 = $1602.25. *Ans.*

30. Find the amount of $250.80 for 10 mos. 10 dys., at 3½%.

Interest at 6% for

10 mos. = $10 \times 0.005 = 0.05$
10 dys. = $10 \times \frac{1}{6}$ of $0.001 = 0.001\frac{2}{3}$
10 mos. 10 dys. = $0.051\frac{2}{3}$ of the principal.

And $0.051\frac{2}{3}$ of $250.80 = $12.96.

Interest of $250.80 for same time at 3½% = $\frac{3\frac{1}{2}}{6}$ of $12.96 = $\frac{7}{12}$ of $12.96 = $7.56.

Amount = $250.80 + $7.56 = $258.36. *Ans.*

31. Find the amount of $377.65 for 1 yr. 3 mos., at 5%.

1 yr. 3 mos. = 1.25 yr.; 5% = 0.05.

Interest of $377.65 for 1 yr. 3 mos. at 5% = 1.25 × 0.05 × $377.65 = $23.60.

Amount = $377.65 + $23.60 = $401.25. *Ans.*

32. Find the amount of $7234.25 for 22 yrs. 2 mos. 20 dys., at 4½%.

Interest at 6% for

22 yrs. = $22 \times 0.06 = 1.32$
2 mos. = $2 \times 0.005 = 0.01$
20 dys. = $20 \times \frac{1}{6}$ of $0.01 = 0.003\frac{1}{3}$
22 yrs. 2 mos. 20 dys. = $1.333\frac{1}{3}$ of the principal.

And $1.33\frac{1}{3}$ of $7234.25 = $9645.67.

Interest of $7234.25 for same time at 4½% = $\frac{3}{4}$ of $9645.67 = $7234.25.

Amount = $7234.25 + $7234.25 = $14,468.50. *Ans.*

33. Find the amount of \$6130 from May 6 to Oct 24, at $3\frac{3}{4}$%.

$$\begin{array}{lrr} & \text{mos.} & \text{dys.} \\ & 10 & 24 \\ & \underline{5} & \underline{6} \\ \text{Interest at } 6\% \text{ for} & 5 & 18 \end{array}$$

5 mos. = 5×0.005 = 0.025
18 dys. = $18 \times \frac{1}{6}$ of 0.001 = 0.003
5 mos. 18 dys. = 0.028 of the principal.

And 0.028 of \$6130 = \$171.64.

Interest of \$6130 for same time at $3\frac{3}{4}\% = \frac{3\frac{3}{4}}{6}$ of \$171.64 = $\frac{5}{8}$ of \$171.64 = \$107.28.

Amount = \$6130 + \$107.28 = \$6237.28. *Ans.*

34. Find the amount of \$258.85 from March 6 to June 24, at 5%.

$$\begin{array}{lrr} & \text{mos.} & \text{dys.} \\ & 6 & 24 \\ & \underline{3} & \underline{6} \\ \text{Interest at } 6\% \text{ for} & 3 & 18 \end{array}$$

3 mos. = 3×0.005 = 0.015
18 dys. = $18 \times \frac{1}{6}$ of 0.001 = 0.003
3 mos. 18 dys. = 0.018 of the principal.

And 0.018 of \$258.85 = \$4.66.
Interest of \$258.85 for same time at 5% = $\frac{5}{6}$ of \$4.66 = \$3.88.
Amount = \$258.85 + \$3.88 = \$262.73. *Ans.*

35. Find the amount of \$25.62 for 33 dys., at 6%.

Interest at 6% for 30 dys. on \$25.62 = $\frac{1}{2}$ of \$0.2562 = \$0.1281
Interest at 6% for 3 dys. on \$25.62 = 0.1 of \$0.1281 = 0.0128
Total interest = \$0.14
Amount = \$25.62 + \$0.14 = \$25.76. *Ans.*

36. Find the amount of \$85.85 for 1 yr. 7 mos. 21 dys., at 6%.

Interest at 6% for

1 yr. = 0.06
7 mos. = 7×0.005 = 0.035
21 dys. = $21 \times \frac{1}{6}$ of 0.001 = 0.0035
1 yr. 7 mos. 21 dys. = 0.0985 of the principal.

And 0.0985 of \$85.85 = \$8.456.
Amount = \$85.85 + \$8.46 = \$94.31. *Ans.*

37. Find the amount of $600 for 93 dys., at 4%.

Interest at 6% for 90 dys. on $600 = 1½ × $6 = $9.
Interest at 6% for 3 dys. on $600 = ⅓ of 0.1 of $6 = 0.20
Interest at 6% for 93 dys. on $600 = $9.20

Interest of $600 for same time at 4% = ⅔ of $9.30 = $6.20.
Amount = $600 + $6.20 = $606.20. *Ans.*

38. Find the amount of $350 from Sept. 21, 1884, to March 5, 1885, at 4%.

yrs.	mos.	dys.
1885	3	5
1884	9	21
	5	14

Interest at 6% for

5 mos. = 5 × 0.005 = 0.025
14 dys. = 14 × ⅙ of 0.001 = 0.002⅓

5 mos. 14 dys. = 0.027⅓ of the principal.

And 0.027⅓ of $350 = $9.57.
Interest of $350 for same time at 4% = ⅔ of $9.57 = $6.38.
Amount = $350 + $6.38 = $356.38. *Ans.*

39. Find the amount of $1226 from Oct. 4, 1884, to May 6, 1885, at 5%.

yrs.	mos.	dys.
1885	5	6
1884	10	4
	7	2

Interest at 6% for

7 mos. = 7 × 0.005 = 0.035
2 dys. = 2 × ⅙ of 0.001 = 0.000⅓

7 mos. 2 dys. = 0.035⅓ of the principal.

And 0.035⅓ of $1226 = $43.32.
Interest of $1226 for same time at 5% = ⅚ of $43.32 = $36.10.
Amount = $1226 + $36.10 = $1262.10. *Ans.*

40. Find the amount of $342.42 from Feb. 5, 1884, to March 15, 1885, at 7%.

yrs.	mos.	dys.
1885	3	15
1884	2	5
1	1	10

Interest at 6% for
1 yr. = 0.06
1 mo. = 0.005
10 dys. = 10 × $\frac{1}{6}$ of 0.001 = 0.001$\frac{2}{3}$
1 yr. 1 mo. 10 dys. = 0.066$\frac{2}{3}$ of the principal.

And 0.06$\frac{2}{3}$ of $342.42 = $22.83.

Interest of $342.42 for same time at 7% = $\frac{7}{6}$ of $22.83 = $26.64.

Amount = $342.42 + $26.64 = $369.06. *Ans.*

41. Find the amount of $360.50 from Aug. 1, 1884, to March 3, 1885, at 6½%.

yrs.	mos.	dys.
1885	3	3
1884	8	1
	7	2

Interest at 6% for
7 mos. = 7 × 0.005 = 0.035
2 dys. = 2 × $\frac{1}{6}$ of 0.001 = 0.000$\frac{1}{3}$
7 mos. 2 dys. = 0.035$\frac{1}{3}$ of the principal.

And 0.035$\frac{1}{3}$ of $360.50 = $12.74.

Interest of $360.50 for same time at 6½% = $\frac{6\frac{1}{2}}{6}$ of $12.74 = $\frac{13}{12}$ of $12.74 = $13.80.

Amount = $360.50 + $13.80 = $374.30. *Ans.*

42. Find the amount of $504.25 from Jan. 8 to March 10, at 6¼%.

mos.	dys.
3	10
1	8
2	2

Interest at 6% for 2 mos. on $504.25 = $5.04
Interest at 6% for 2 dys. on $504.25 = $\frac{1}{3}$ of 0.1 of $5.04 = 0.17
Interest at 6% for 2 mos. 2 dys. on $504.25 = $5.21

Interest of $504.25 for same time at 6¼% = $\frac{6\frac{1}{4}}{6}$ of $5.21 = $\frac{25}{24}$ of $5.21 = $5.43.

Amount = $504.25 + $5.43 = $509.68. *Ans.*

43. Find the amount of \$1240 from March 3 to Aug. 28, at 7%.

mos.	dys.
8	28
3	3
5	25

Interest at 6% for

5 mos. = 3 × 0.005 = 0.025
25 dys. = 25 × $\frac{1}{6}$ of 0.001 = 0.004$\frac{1}{6}$
5 mos. 25 dys. = 0.029$\frac{1}{6}$ of the principal.

And 0.029$\frac{1}{6}$ of \$1240 = \$36.17.
Interest of \$1240 for same time at 7% = $\frac{7}{6}$ of \$36.17 = \$42.20.
Amount = \$1240 + \$42.20 = \$1282.20. *Ans.*

Ex. 143. Page 230.

1. Find the rate per cent when the interest on \$500 for 1 yr. 6 mos. is \$67.50.

1 yr. 6 mos. = 1$\frac{1}{2}$ yrs.; 1 yr. is $\frac{2}{3}$ of 1$\frac{1}{2}$ yrs.
Interest on \$500 for 1$\frac{1}{2}$ yrs. = \$67.50.
Interest on \$500 for 1 yr. = $\frac{2}{3}$ of \$67.50.
Interest on \$1 for 1 yr. is $\frac{1}{500}$ of $\frac{2}{3}$ of \$67.50 = \$0.09.
But \$0.09 = 9% of \$1. 9%. *Ans.*

2. Find the rate per cent when the interest on \$250 for 2 yrs. is \$52.50.

Interest on \$250 for 2 yrs. is \$52.50.
Interest on \$250 for 1 yr. = $\frac{1}{2}$ of \$52.50.
Interest on \$1 for 1 yr. is $\frac{1}{250}$ of $\frac{1}{2}$ of \$52.50 = \$0.105.
But \$0.105 = 10$\frac{1}{2}$% of \$1. 10$\frac{1}{2}$%. *Ans.*

3. Find the rate per cent when \$500 amount to \$754 in 9 yrs.

Interest is \$754 − \$500 = \$254.
Interest on \$500 for 9 yrs. = \$254.
Interest on \$500 for 1 yr. = \$$\frac{254}{9}$.
Interest on \$1 for 1 yr. = \$$\frac{254}{9 \times 500}$ = \$0.05$\frac{29}{45}$.
But \$0.05$\frac{29}{45}$ = 5$\frac{29}{45}$% of \$1. 5$\frac{29}{45}$%. *Ans.*

4. Find the rate per cent when the interest on \$725 for 12 yrs. is $\$141.37\frac{1}{2}$.

Interest on \$725 for 12 yrs. $= \$141.37\frac{1}{2}$.
Interest on \$725 for 1 yr. $= \frac{1}{12}$ of $\$141.37\frac{1}{2}$.
Interest on \$1 for 1 yr. $= \frac{1}{725}$ of $\frac{1}{12}$ of $\$141.37\frac{1}{2} = \$0.01\frac{5}{8}$.
But $\$0.01\frac{5}{8}$ is $1\frac{5}{8}\%$ of \$1. $1\frac{5}{8}\%$. *Ans.*

5. Find the rate per cent when \$880 amounts to \$899.25 for 7 mos.

Interest $= \$899.25 - \$880 = \$19.25$.
Interest on \$880 for 7 mos. $= \$19.25$.
Interest on \$880 for 1 yr. $= \frac{12}{7}$ of \$19.25.

$$\text{Interest on \$1 for 1 yr.} = \frac{1}{\underset{\underset{4}{\cancel{220}}}{\cancel{880}}} \text{ of } \frac{\overset{3}{\cancel{12}}}{\cancel{7}} \text{ of } \$\overset{\overset{0.05}{\cancel{2.75}}}{\cancel{19.25}} = \$0.03\tfrac{3}{4}.$$

But $\$0.03\frac{3}{4}$ is $3\frac{3}{4}\%$ of \$1. $3\frac{3}{4}\%$. *Ans.*

6. Find the rate per cent when the interest on \$424 for 2 yrs. 6 mos. is \$26.50.

2 yrs. 6 mos. $= 2\frac{1}{2}$ yrs.; 1 yr. $= \frac{2}{5}$ of $2\frac{1}{2}$ yrs.
Interest on \$424 for $2\frac{1}{2}$ yrs. $= \$26.50$.
Interest on \$424 for 1 yr. $= \frac{2}{5}$ of \$26.50.

$$\text{Interest on \$1 for 1 yr.} = \$\frac{2 \times \overset{\overset{0.05}{\cancel{5.30}}}{\cancel{26.50}}}{\cancel{5} \times \underset{\underset{2}{\cancel{4}}}{\cancel{424}}} = \$0.02\tfrac{1}{2}.$$

But $\$0.02\frac{1}{2}$ is $2\frac{1}{2}\%$ of \$1. $2\frac{1}{2}\%$. *Ans.*

7. Find the rate per cent when the interest on \$255.50 from April 1 to June 20 is \$2.80.

$$\begin{array}{rr} \text{mos.} & \text{dys.} \\ 6 & 20 \\ 4 & 1 \\ \hline 2 & 19 \end{array}$$

2 mos. 19 dys. $= 79$ dys. $= \frac{79}{360}$ yr.
Interest on \$255.50 for 79 dys. $= \$2.80$.
Interest on \$255.50 for 1 yr. $= \frac{360}{79}$ of \$2.80.

$$\text{Interest on \$1 for 1 yr.} = \frac{1}{\underset{\underset{7.3}{\cancel{51.1}}}{\cancel{255.5}}} \text{ of } \frac{\overset{72}{\cancel{360}}}{79} \text{ of } \$\overset{0.40}{\cancel{2.80}} = \$0.05, \text{ nearly.}$$

\$0.05 is 5% of \$1. 5%. *Ans.*

8. Find the rate per cent when $175 amount to $203.35 for 3 yrs. 7 mos. 6 dys.

6 dys. = $\frac{1}{5}$ mo.; $7\frac{1}{5}$ mos. = $\frac{7\frac{1}{5}}{12} = \frac{3}{5}$ yr.; $3\frac{3}{5}$ yrs. = time.
1 yr. = $\frac{5}{18}$ of $3\frac{3}{5}$ yrs.
Interest = $203.35 – $175 = $28.35.
Interest on $175 for $3\frac{3}{5}$ yrs. = $28.35.
Interest on $175 for 1 yr. = $\frac{5}{18}$ of $28.35.

$$\text{Interest on \$1 for 1 yr.} = \frac{1}{\underset{\substack{\cancel{35}\\ 7}}{\cancel{175}}} \text{ of } \frac{\cancel{5}}{18} \text{ of } \$\overset{5.67}{\cancel{28.35}} = \$0.04\tfrac{1}{2}.$$

$0.04½ is 4½% of $1. 4½%. *Ans.*

9. Find the rate per cent when a sum of money is doubled in 16 yrs.

Interest on $1 for 16 yrs. = $1.
Interest on $1 for 1 yr. = $\frac{1}{16}$ of $1 = $0.06¼.
But $0.06¼ is 6¼% of $1. 6¼%. *Ans.*

10. Find the rate per cent when an investment for 6 yrs. produces a sum equal to $\frac{2}{5}$ of the capital.

Interest on $1 for 6 yrs. = $$\frac{2}{5}$.
Interest on $1 for 1 yr. = $\frac{1}{6}$ of $$\frac{2}{5}$ = $$\frac{1}{15}$ = $0.06⅔.
But $0.06⅔ is 6⅔% of $1. 6⅔%. *Ans.*

Ex. 144. Page 230.

1. Find the time in which the interest on $225 will be $36, at 4%

Interest on $225 at 4% for 1 yr. = $9.
Number of years = $\frac{36}{9}$ = 4. 4 yrs. *Ans.*

2. Find the time in which $440 will amount to $505.45, at 4¼%.

Interest = $505.45 – $440 = $65.45.
Interest on $440 at 4¼% for 1 yr. = $18.70.
Number of years = $\frac{65.45}{18.70}$ = 3.5. 3½ yrs. *Ans.*

3. Find the time in which $250 will double itself, at 2½%.

Interest on $250 at 2½% for 1 yr. = $6.25.

Number of years $= \dfrac{\overset{10}{\cancel{250}}}{\underset{0.25}{\cancel{6.25}}} = 40.$ 40 yrs. *Ans.*

4. Find the time in which $225 will amount to $256.50, at 3½%.

Interest = $256.50 − $225 = $31.50.

Interest on $225 at 3½% for 1 yr. = $7.87½.

Number of years $= \dfrac{31.50}{7.875} = 4.$ 4 yrs. *Ans.*

5. Find the time in which $50 will amount to $85, at 6%.

Interest = $85 − $50 = $35.

Interest on $50 at 6% for 1 yr. = $3.

Number of years $= \frac{35}{3} = 11\frac{2}{3}.$ $11\frac{2}{3}$ yrs. = 11 yrs. 8 mos. *Ans.*

6. Find the time in which the interest on $4260 will be $873.30, at 6%.

Interest on $4260 at 6% for 1 yr. = $255.60.

Number of years $= \dfrac{873.30}{255.60} = 3.41\frac{2}{3}.$ $3.41\frac{2}{3}$ yrs. = 3 yrs. 5 mos. *Ans.*

7. Find the time in which $1005.34 will amount to $1156.14, at 4½%.

Interest = $1156.14 − $1005.34 = $150.80.

Interest on $1005.34 at 4½% for 1 yr. = $45.24.

Number of years $= \dfrac{150.80}{45.24} = 3\frac{1}{3}.$ $3\frac{1}{3}$ yrs. = 3 yrs. 4 mos. *Ans.*

8. Find the time in which $1587.75 will amount to $1611.68, at 5½%.

Interest = $1611.68 − $1587.75 = $23.93.

Interest on $1587.75 at 5½% for 1 yr. = $87.33.

Number of years $= \dfrac{23.93}{87.33} = 0.274.$ 0.274 yr. = 3 mos. 9 dys. *Ans.*

9. Find the time in which a sum of money will double itself, at 6%.

Interest on $1 at 6% for 1 yr. = $0.06.

Number of years $= \dfrac{1}{0.06} = 16\frac{2}{3}.$ $16\frac{2}{3}$ yrs. = 16 yrs. 8 mos. *Ans.*

10. Find the time in which \$1000 will amount to \$1125, at 4%.

Interest = \$1125 − \$1000 = \$125.

Interest on \$1000 at 4% for 1 yr. = \$40.

Number of years = $\frac{125}{40} = 3\frac{1}{8}$. $3\frac{1}{8}$ yrs. = 3 yrs. 1 mo. 15 dys. *Ans.*

Ex. 145. Page 231.

1. Find the principal that will produce \$180 interest in 3 yrs., at 4%.

Interest for 1 yr. = $\$\frac{180}{3} = \$60$.

Interest on \$1 for 1 yr. at 4% = 0.04 of \$1.

Hence principal required = $\$\frac{60}{0.04} = \$1500$. *Ans.*

2. Find the principal that will produce \$189 interest in 3 yrs., at $6\frac{1}{4}$%.

Interest for 1 yr. = $\$\frac{189}{3} = \$63$.

Interest on \$1 for 1 yr. at $6\frac{1}{4}\% = 0.06\frac{1}{4}$ of \$1.

Hence principal required = $\$\frac{63}{0.06\frac{1}{4}} = \$1008$. *Ans.*

3. Find the principal that will produce \$3493.20 interest in 3 yrs. 5 mos., at 6%.

3 yrs. 5 mos. = $3\frac{5}{12}$ yrs.

Interest for 1 yr. = $\$\frac{3493.20}{3\frac{5}{12}} = \$1022.40$.

Interest on \$1 for 1 yr. at 6% = 0.06 of \$1.

Hence principal required = $\$\frac{1022.40}{0.06} = \$17{,}040$. *Ans.*

4. Find the principal that will produce \$10.70 interest in 5 mos., at 4%.

5 mos. = $\frac{5}{12}$ yr.

Interest for 1 yr. = $\$\frac{10.70}{\frac{5}{12}} = \$25.68$.

Interest on \$1 for 1 yr. at 4% = 0.04 of \$1.

Hence principal required = $\$\frac{25.68}{0.04} = \$642$. *Ans.*

5. Find the principal that will produce \$75.40 interest in 3 yrs. 4 mos., at $4\frac{1}{2}\%$. 3 yrs. 4 mos. = $3\frac{1}{3}$ yrs.

Interest for 1 yr. = $\$\frac{75.40}{3\frac{1}{3}} = \$22.62$.

Interest on \$1 for 1 yr. at $4\frac{1}{2}\% = 0.045$ of \$1.

Hence principal required = $\$\frac{22.62}{0.045} = \$502.67$. *Ans.*

6. Find the principal that will produce \$75.05 interest in 3 mos. 2 dys., at $4\frac{1}{4}\%$.

3 mos. 2 dys. = $\frac{90}{360} + \frac{2}{360} = \frac{92}{360} = \frac{23}{90}$ yr.

Interest for 1 yr. = $\$\frac{75.05}{\frac{23}{90}} = \$293.674$.

Interest of \$1 for 1 yr. at $4\frac{1}{4}\% = 0.0425$ of \$1.

Hence principal required = $\$\frac{293.674}{0.0425} = \$6909.97$. *Ans.*

7. Find the principal that will produce \$1746.60 interest in 3 yrs. 5 mos., at 6%.

3 yrs. 5 mos. = $3\frac{5}{12}$ yrs.

Interest for 1 yr. = $\$\frac{1746.60}{3\frac{5}{12}} = \$511.20$.

Interest on \$1 for 1 yr. at 6% = 0.06 of \$1.

Hence principal required = $\$\frac{511.20}{0.06} = \$8520$. *Ans.*

8. Find the principal that will produce \$64.46 interest in 6 yrs., at $4\frac{1}{2}\%$. Interest for 1 yr. = $\$\frac{64.46}{6} = \$10.743$.

Interest on \$1 for 1 yr. at $4\frac{1}{2}\% = 0.045$ of \$1.

Hence principal required = $\$\frac{10.743}{0.045} = \$238.74$. *Ans.*

9. Find the principal that will produce \$80.62$\frac{1}{2}$ interest in 3 yrs. 9 mos., at 4%.

3 yrs. 9 mos. = 3.75 yrs.

Interest for 1 yr. = $\$\frac{80.625}{3.75} = \$21.50$.

Interest on \$1 for 1 yr. at 4% = 0.04 of \$1.

Hence principal required = $\$\frac{21.50}{0.04} = \$537.50$. *Ans.*

10. Find the principal that will produce $669.64 interest in 2 yrs. 7 mos. 24 dys., at 6%.

24 dys. = $\frac{4}{5}$ mo.; $7\frac{4}{5}$ mos. = $\frac{7\frac{4}{5}}{12} = \frac{13}{20}$ yr. = 0.65 yr.

Whole time = 2.65 yrs.

Interest for 1 yr. = $\$\frac{669.64}{2.65} = \$252.694$.

Interest on $1 for 1 yr. at 6% = 0.06 of $1.

Hence principal required = $\$\frac{252.694}{0.06} = \$4211.57$. *Ans.*

Ex. 146. Page 232.

1. Find the principal that will amount to $1680 in 3 yrs., at 4%.

Let the principal be represented by 100.
The interest will be represented by $3 \times 4 = 12$.
The amount will be represented by $100 + 12 = 112$.
Hence the principal = $\frac{100}{112}$ of $1680 = $1500. *Ans.*

2. Find the principal that will amount to $962 in $4\frac{1}{2}$ yrs., at $4\frac{1}{2}$%.

Let the principal be represented by 100.
The interest will be represented by $4\frac{1}{2} \times 4\frac{1}{2} = 20.25$.
The amount will be represented by $100 + 20.25 = 120.25$.
Hence the principal = $\frac{100}{120.25}$ of $962 = $800. *Ans.*

3. Find the principal that will amount to $725.47 in 2 yrs. 3 mcs., at $3\frac{1}{2}$%. 2 yrs. 3 mos. = 2.25 yrs.

Let the principal be represented by 100.
The interest will be represented by $2.25 \times 3.5 = 7.875$.
The amount will be represented by $100 + 7.875 = 107.875$.
Hence the principal = $\frac{100}{107.875}$ of $725.47 = $672.50. *Ans.*

4. Find the principal that will amount to $3215.83 in 4 yrs. 6 mos., at 3%. 4 yrs. 6 mos. = 4.5 yrs.

Let the principal be represented by 100.
The interest will be represented by $4.5 \times 3 = 13.5$.
The amount will be represented by $100 + 13.5 = 113.5$.
Hence the principal = $\frac{100}{113.5}$ of $3215.83 = $2833.33. *Ans.*

5. Find the principal that will amount to $595.20 in 8 mos., at 6%.

8 mos. = $\frac{2}{3}$ yr.
Let the principal be represented by 100.
The interest will be represented by $\frac{2}{3}$ of 6 = 4.
The amount will be represented by 100 + 4 = 104.
Hence the principal = $\frac{100}{104}$ of $595.20 = $572.31. *Ans.*

6. Find the principal that will amount to $1275.75 in 1 yr. 1 mo., at 5%.

1 yr. 1 mo. = $1\frac{1}{12}$ yrs.
Let the principal be represented by 100.
The interest will be represented by $1\frac{1}{12} \times 5 = 5\frac{5}{12}$.
The amount will be represented by $100 + 5\frac{5}{12} = 105\frac{5}{12}$.
Hence the principal = $\frac{100}{105\frac{5}{12}}$ of $1275.75 = $1210.20. *Ans.*

7. Find the principal that will amount to $2053.32 in 3 yrs. 5 mos., at 6%.

3 yrs. 5 mos. = $3\frac{5}{12}$ yrs.
Let the principal be represented by 100.
The interest will be represented by $3\frac{5}{12} \times 6 = 20\frac{1}{2}$.
The amount will be represented by $100 + 20\frac{1}{2} = 120.5$.
Hence the principal = $\frac{100}{120.5}$ of $2053.32 = $1704. *Ans.*

8. Find the principal that will amount to $131.88 in 2 yrs. 11 mos. 15 dys., at 6%.

15 dys. = $\frac{1}{2}$ mo.; $11\frac{1}{2}$ mos. = $\frac{11\frac{1}{2}}{12} = \frac{23}{24}$ yr.
Whole time = $2\frac{23}{24}$ yrs.
Let the principal be represented by 100.
The interest will be represented by $2\frac{23}{24} \times 6 = 17.75$.
The amount will be represented by 100 + 17.75 = 117.75.
Hence the principal = $\frac{100}{117.75}$ of $131.88 = $112. *Ans.*

9. Find the principal that will amount to $37.02 in 2 yrs. 3 mos. 18 dys., at 5%.

18 dys. = $\frac{3}{5}$ mo.; $3\frac{3}{5}$ mos. = $\frac{3\frac{3}{5}}{12} = \frac{18}{60} = 0.3$ yr.

Whole time = 2.3 yrs.
Let the principal be represented by 100.
The interest will be represented by $2.3 \times 5 = 11.5$.
The amount will be represented by $100 + 11.5 = 111.5$.
Hence the principal $= \frac{100}{111.5}$ of \$37.02 = \$33.20. *Ans.*

10. Find the principal that will amount to \$2359.38 in 2 yrs. 7 mos. 24 dys., at $4\frac{1}{2}\%$.

24 dys. = $\frac{4}{5}$ mo.; $7\frac{4}{5}$ mos. $= \frac{7\frac{4}{5}}{12} = \frac{39}{60} = \frac{13}{20} = 0.65$ yr.
Whole time = 2.65 yrs.
Let the principal be represented by 100.
The interest will be represented by $2.65 \times 4.5 = 11.925$.
The amount will be represented by $100 + 11.925 = 111.925$.
Hence the principal $= \frac{100}{111.925}$ of \$2359.38 = \$2108. *Ans.*

Ex. 147. Page 235.

Find the *day of maturity*, the *time to run*, the *discount*, and the *proceeds*, on the following notes:

1. \$2250. CONCORD, N.H., Jan. 1, 1885.

Four months from date I promise to pay to the order of George Marston twenty-two hundred and fifty dollars, for value received.

Discounted at 7%, Jan. 12. SIMON STEVENS.

4 mos. and 3 dys. from Jan. 1 is May 4.

Time to run is 19 dys. in Jan., 28 in Feb., 31 in March, 30 in April, and 4 in May = 112 dys.

Discount is the interest on \$2250 for 112 dys. at 7%.
Therefore the discount is $\frac{7}{6}$ of $0.018\frac{2}{3}$ of \$2250 = \$49.
Proceeds = \$2250 − \$49 = \$2201.
May $^{1}/_{4}$; 112 dys.; \$49; \$2201. *Ans.*

2. \$432.55. NEW YORK, Jan. 3, 1885.

Sixty days from date I promise to pay James Wilson, or order, four hundred thirty-two and $\frac{55}{100}$ dollars, value received.

Discounted at $6\frac{1}{2}\%$, Jan. 6. JOHN ALLEN.

63 dys. from Jan. 3 is March 7.

Time to run is 25 dys. in Jan., 28 in Feb., and 7 in March = 60 dys.

Discount is interest on \$432.55 for 60 dys. at 6½% = \$4.69.

Proceeds is \$432.55 − \$4.69 = \$427.86.

March $^{4}/_{7}$; 60 dys.; \$4.69; \$427.86. *Ans.*

3. \$670.35. St. Louis, Jan. 6, 1885.

*Ninety days from date I promise to pay to the order of Peter Holmes six hundred seventy and $\frac{35}{100}$ dollars, value received.

Discounted at 7%, Jan. 26. Robert Day.

93 dys. from Jan. 6 is April 9.

The time to run is 6 dys. in Jan., 28 in Feb., 31 in March, and 9 in April = 74 dys.

Discount is the interest on \$670.35 for 74 dys. at 7% = \$9.65.

Proceeds = \$670.35 − \$9.65 = \$660.70.

April $^{6}/_{9}$; 74 dys.; \$9.65; \$660.70. *Ans.*

4. \$1304.90. Cincinnati, Jan. 25, 1885.

Five months after date I promise to pay to the order of John Shannon thirteen hundred four and $\frac{90}{100}$ dollars, for value received, with interest at six per cent.

Discounted at 4½%, March 15. Charles Hillman.

Interest on note for 5 mos. and 3 dys. = \$33.27.

Amount of note when due is \$1304.90 + \$33.27 = \$1338.17.

5 mos. and 3 dys. from Jan. 25 is June 28.

Time to run, 3 mos. 13 dys.

Discount on \$1338.17 at 4½% for 3 mos. 13 dys. = \$17.23.

Proceeds = \$1338.17 − \$17.23 = \$1320.94.

June $^{25}/_{28}$; 3 mos. 13 dys.; \$17.23; \$1320.94. *Ans.*

5. \$2260. Baltimore, Md., June 19, 1885.

*Sixty days from date I promise to pay to the order of John Morrison twenty-two hundred and sixty dollars, value received.

Discounted at 5½%, July 16. Frank Howe.

*Note.—In Delaware, Maryland, Missouri, Pennsylvania, and the District of Columbia, banks reckon the *day of discount* in the time for which they charge interest; that is, they charge interest on a 30-day, 60-day, or 90-day note for 34, 64, 94 days, respectively.

63 dys. from June 19 is Aug. 21.

The time to run is 16 dys. in July and 21 in August = 37 dys.

Discount is the interest on $2260 for 37 dys. at 5½%.

Therefore the discount = $\frac{5\frac{1}{2}}{6}$ of 0.006⅙ of $2260 = $12.78.

Proceeds = $2260 − $12.78 = $2247.22.

Aug. $^{18}/_{21}$; 37 dys.; $12.78; $2247.22. *Ans.*

6. $645. AUSTIN, TEX., July 28, 1885.

Thirty days from date I promise to pay to the order of John Moses six hundred and forty-five dollars, value received.

Discounted at 6%, Aug. 3. RICHARD SMITH.

33 dys. from July 28 is Aug. 30.

Time to run is 27 dys.

The discount is the interest on $645 for 27 dys. at 6% = $2.90.

Proceeds = $645 − $2.90 = $642.10.

Aug. $^{27}/_{30}$; 27 dys.; $2.90; $642.10. *Ans.*

7. $1000. SAVANNAH, GA., Oct. 4, 1884.

Six months after date I promise to pay to John Proctor, or order, one thousand dollars, value received, with interest at seven per cent.

Discounted at 8%, Dec. 31. JAMES WHITRIDGE.

Interest on note for 6 mos. and 3 dys. = $35.58.

Amount of note when due = $1000 + $35.58 = $1035.58.

Day of maturity, April $^{4}/_{7}$, 1885.

Time to run 3 mos. 7 dys.

Discount on $1035.58 at 8% for 3 mos. 7 dys. = $22.32.

Proceeds = $1035.58 − $22.32 = $1013.26.

April $^{4}/_{7}$; 3 mos. 7 dys.; $22.32; $1013.26. *Ans.*

8. $2912.60. PHILADELPHIA, Feb. 19, 1885.

Ninety days after date I promise to pay to the order of George Wright twenty-nine hundred twelve and $\frac{60}{100}$ dollars, value received.

Discounted at 6%, March 1. PETER BURKE.

93 dys. from Feb. 19 is May 23.

Time to run is 31 dys. in March, 30 in April, 23 in May = 84 dys.

The discount is the interest on $2912.60 for 84 dys. at 6%.
Therefore the discount is 0.014 of $2912.60 = $40.78.
Proceeds = $2912.60 − $40.78 = $2871.82.
May $^{20}/_{23}$; 84 dys.; $40.78; $2871.82. *Ans.*

9. $455.04. CHARLESTON, S. C., Sept. 2, 1885.

Four months from date I promise to pay to the order of Edmund Horne four hundred fifty-five and $\frac{4}{100}$ dollars, value received.

Discounted at $5\frac{1}{3}$%. Sept 16. PAUL WEST.

4 mos. and 3 dys. from Sept. 2, 1885, is Jan. 5, 1886.
Time to run is 3 mos. 20 dys.
Discount is the interest on $455.04 for 3 mos. 20 dys. at $5\frac{1}{2}$%.
Therefore the discount is $\frac{5\frac{1}{2}}{6}$ of $0.018\frac{1}{3}$ of $455.04 = $7.65.
Proceeds = $455.04 − 7.65 = $447.39.
Jan. $^{2}/_{5}$; 3 mos. 20 dys.; $7.65; $447.39. *Ans.*

10. $1140. NEW ORLEANS, LA., July 1, 1885.

Ninety days after date I promise to pay to the order of William Whitridge eleven hundred and forty dollars, value received.

Discounted at $7\frac{1}{2}$%. Aug. 15. JOHN CLEMENT.

93 dys. from July 1 is Oct. 2.
Time to run is 16 dys. in Aug., 30 in Sept., 2 in Oct. = 48 dys.
Discount is the interest on $1140 for 48 dys. at $7\frac{1}{2}$%.
Therefore the discount is $\frac{7\frac{1}{2}}{6}$ of 0.008 of $1140 = $11.40.
Proceeds = $1140 − $11.40 = $1128.60.
Oct. 2; 48 dys.; $11.40; $1128.60. *Ans.*

11. $10,089.25. DENVER, COL., Oct. 14, 1885.

Ninety days after date I promise to pay to the order of John Higgins ten thousand eighty-nine and $\frac{25}{100}$ dollars, value received.

Discounted at 10%. Dec. 1. JOHN KELLEY.

93 dys. from Oct. 13, 1885, is Jan. 15, 1886.
Time to run is 30 dys. in Dec. and 15 in Jan. = 45 dys.
Discount is the interest on $10,089.25 for 45 dys. at 10%.
45 dys. = $\frac{45}{360}$ = $\frac{1}{8}$ yr.

Therefore the discount is ⅛ of $\frac{10}{100}$ of $10,089.25 = $126.12.
Proceeds = $10,089.25 − $126.12 = $9963.13.
Jan. $^{12}/_{15}$; 45 dys.; $126.12; $9963.13. *Ans.*

Ex. 148. Page 237.

1. Find the face of a note for 30 dys. that will realize $600 when discounted at 6½ %.

The discount on $1 for 33 dys. at 6½ % = $0.00596.
Proceeds of $1 is $1 − $0.00596 = $0.99404 = 0.99404 of $1.
Therefore the face required is $600 ÷ 0.99404 = $603.60. *Ans.*

2. Find the face of a note for 60 dys. that will realize $8000 when discounted at 8 %.

The discount on $1 for 63 dys. at 8 % = $0.014.
Proceeds of $1 is $1 − $0.014 = $0.986 = 0.986 of $1.
Therefore the face required is $8000 ÷ 0.986 = $8113.60. *Ans.*

3. Find the face of a four-months' note that will realize $800 when discounted at 5½ %.

The discount on $1 for 4 mos. 3 dys. at 5½ % = $0.01879.
Proceeds of $1 is $1 − $0.01879 = $0.98121 = 0.98121 of $1.
Therefore the face required is $800 ÷ 0.98121 = $815.32. *Ans.*

4. Find the face of a note for 90 dys. that will realize $1700 when discounted at 7 %.

The discount on $1 for 93 dys. at 7 % = $0.0180⅚.
Proceeds of $1 is $1 − $0.0180⅚ = $0.9819⅙ = $0.9819⅙ of $1.
Therefore the face required is $1700 ÷ 0.9819⅙ = $1731.31. *Ans.*

5. Find the face of a two-months' note that will realize $900 when discounted at $7\frac{3}{10}$ %.

The discount on $1 for 2 mos. 3 dys. at $7\frac{3}{10}$ % = $0.012775.
Proceeds of $1 is $1 − $0.012775 = $0.987225 = 0.987225 of $1.
Therefore the face required is $900 ÷ 0.987225 = $911.64. *Ans.*

6. Find the face of a three-months' note that will realize $2200 when discounted at 7 %.

The discount on $1 for 3 mos. 3 dys. at 7 % = $0.0180⅚.
Proceeds of $1 is $1 − $0.0180⅚ = $0.9819⅙ = 0.9819⅙ of $1.
Therefore the face required is $2200 ÷ 0.9819⅙ = $2240.52. *Ans.*

Ex. 149. Page 239.

1. Find the net amount of a bill of $320 subject to a discount of 10% for cash.

$10\% \text{ of } \$320 = \frac{1}{10} \text{ of } \$320 = \$32.$
$\$320 - \$32 = \$288.$ *Ans.*

2. Find the net amount of a bill of $1680 subject to discounts of 15 and 10.

$15\% \text{ of } \$1680 = \frac{3}{20} \text{ of } \$1680 = \$252.$
$\$1680 - \$252 = \$1428.$
$10\% \text{ of } \$1428 = \frac{1}{10} \text{ of } \$1428 = \$142.80.$
$\$1428 - \$142.80 = \$1285.20.$ *Ans.*

3. Find the net amount of a bill of $980 with 15 off.

$15\% \text{ of } \$980 = \frac{3}{20} \text{ of } \$980 = \$147.$
$\$980 - \$147 = \$833.$ *Ans.*

4. Find the net amount of a bill of $1620 with 20 and 15 off.

$20\% \text{ of } \$1620 = \frac{1}{5} \text{ of } \$1620 = \$324.$
$\$1620 - \$324 = \$1296.$
$15\% \text{ of } \$1296 = \frac{3}{20} \text{ of } \$1296 = \$194.40.$
$\$1296 - \$194.40 = \$1101.60.$ *Ans.*

5. Find the net amount of a bill of $1440 with 25, 10, and 5 off.

$25\% \text{ of } \$1440 = \frac{1}{4} \text{ of } \$1440 = \$360.$
$\$1440 - \$360 = \$1080.$
$10\% \text{ of } \$1080 = \frac{1}{10} \text{ of } \$1080 = \$108.$
$\$1080 - \$108 = \$972.$
$5\% \text{ of } \$972 = \frac{1}{20} \text{ of } \$972 = \$48.60.$
$\$972 - \$48.60 = \$923.40.$ *Ans.*

6. Find the net amount of a bill of $587.50 with 35 and 15 off.

$35\% \text{ of } \$587.50 = \frac{7}{20} \text{ of } \$587.50 = \$205.62.$
$\$587.50 - \$205.62 = \$381.88.$
$15\% \text{ of } \$381.88 = \frac{3}{20} \text{ of } \$371.88 = \$57.28.$
$\$381.88 - \$57.28 = \$324.60.$ *Ans.*

. Find the net amount of a bill of $1920 with 25 and 7½ off.

25% of $1920 = $\frac{1}{4}$ of $1920 = $480.
$1920 – $480 = $1440.
7½% of $1440 = $\frac{3}{40}$ of $1440 = $108.
$1440 – $108 = $1332. *Ans.*

. Find the net amount of a bill of $1530 with 25, 10, and 5 off.

25% of $1530 = $\frac{1}{4}$ of $1530 = $382.50.
$1530 – $382.50 = $1147.50.
10% of $1147.50 = $\frac{1}{10}$ of $1147.50 = $114.75.
$1147.50 – $114.75 = $1032.75.
5% of $1032.75 = $\frac{1}{20}$ of $1032.75 = $51.63.
$1032.75 – $51.63 = $981.12. *Ans.*

. Find the net amount of a bill of $500 with 25, 15, and 12½ off.

25% of $500 = $\frac{1}{4}$ of $500 = $125.
$500 – $125 = $375.
15% of $375 = $\frac{3}{20}$ of $375 = $56.25.
$375 – $56.25 = $318.75.
12½% of $318.75 = $\frac{1}{8}$ of $318.75 = $39.84.
$318.75 – $39.84 = $278.91. *Ans.*

0. Find the net amount of a bill of $870.40 with 30, 22½, and 12½ off.

30% of $870.40 = $\frac{3}{10}$ of $870.40 = $261.12.
$870.40 – $261.12 = $609.28.
22½% of $609.28 = $\frac{9}{40}$ of $609.28 = $137.09.
$609.28 – $137.09 = $472.19.
12½% of $472.19 = $\frac{1}{8}$ of $472.19 = $59.02.
$472.19 – $59.02 = $413.17. *Ans.*

1. Find the net cash amount of a bill of $1088, discounts being 50 10, and an additional discount of 5% for cash.

50% of $1088 = $\frac{1}{2}$ of $1088 = $544.
$1088 – $544 = $544.
10% of $544 = $\frac{1}{10}$ of $544 = $54.40.
$544 – $54.40 = $489.60.
5% of $489.60 = $\frac{1}{20}$ of $489.60 = $24.48.
$489.60 – $24.48 = $465.12. *Ans.*

12. Find the difference between a single discount of 55, and successive discounts of 40 and 15.

40% and 15% = 40 + 15 − 6 = 49%.
55% − 49% = 6%. *Ans.*

13. Find the net cash amount of a bill of $136, discounts being 50, 10, and 5. Find a single discount equivalent to these three successive discounts.

50% of $136 = $\frac{1}{2}$ of $136 = $68.
$136 − $68 = $68.
10% of $68 = $\frac{1}{10}$ of $68 = $6.80.
$68 − $6.80 = $61.20.
5% of $61.20 = $\frac{1}{20}$ of $61.20 = $3.06.
$61.20 − $3.06 = $58.14. *Ans.*
50% and 10% = 50 + 10 − 5 = 55%.
55% and 5% = 55 + 5 − 2$\frac{3}{4}$ = 57$\frac{1}{4}$%. *Ans.*

14. Find the net cash amount of a bill of $164.50, discounts being $\frac{2}{3}$ and 30.

$\frac{2}{3}$ of $164.50 = $109.67.
$164.50 − $109.67 = $54.83.
30% of $54.83 = $\frac{3}{10}$ of $54.83 = $16.45.
$54.83 − $16.45 = $38.38. *Ans.*

15. Find the net cash amount of a bill of $15, discounts being 40, 5, 25, and 17$\frac{1}{2}$. Find a single discount equivalent to these four successive discounts.

40% of $15 = $\frac{2}{5}$ of $15 = $6.
$15 − $6 = $9.
5% of $9 = $\frac{1}{20}$ of $9 = $0.45.
$9 − $0.45 = $8.55.
25% of $8.55 = $\frac{1}{4}$ of $8.55 = $2.14.
$8.55 − $2.14 = $6.41.
17$\frac{1}{2}$% of $6.41 = $\frac{7}{40}$ of $6.41 = $1.12.
$6.41 − $1.12 = $5.29. *Ans.*
40% and 5% = 40 + 5 − 2 = 43%.
43% and 25% = 43 + 25 − 10$\frac{3}{4}$ = 57$\frac{1}{4}$%.
57$\frac{1}{4}$% and 17$\frac{1}{2}$% = 57$\frac{1}{4}$ + 17$\frac{1}{2}$ − 10 = 64$\frac{3}{4}$%. *Ans.*

Ex. 150. Page 241.

1. A note for $3000, dated April 1, 1884, payable on demand, with interest at 7 %, bears the following indorsements: May 6, $600; July 5, $676.11; Oct. 18, $966. What is due Jan. 1, 1885?

Amount of $3000 for 1 yr. at 7% = $3157.50
Amount of $600 for 235 dys. at 7% = $627.42
Amount of $676.11 for 176 dys. at 7% = 699.24
Amount of $966 for 73 dys. at 7% = 979.71 2306.37
Balance due, $851.13 *Ans.*

2. A note for $1237.50, dated April 17, 1884, payable on demand, bears the following indorsements: June 5, $253; Aug. 20, $274.50; Nov. 17, $420. What is due Jan. 1, 1885, reckoning interest at 6%?

Amount of $1237.50 for 254 dys. at 6% = $1289.88
Amount of $253 for 206 dys. at 6% = $261.69
Amount of $274.50 for 131 dys. at 6% = 280.49
Amount of $420 for 44 dys. at 6% = 423.08 965.26
Balance due, $324.62 *Ans.*

3. A note for $775.50, dated May 15, 1884, payable on demand, bears the following indorsements: July 21, $150; Oct. 10, $250; Feb. 24, 1885, $100. What is due May 15, 1885, reckoning interest at 6%?

Amount of $775.50 for 1 yr. at 6% = $822.03
Amount of $150 for 294 dys. at 6% = $157.35
Amount of $250 for 215 dys. at 6% = 258.96
Amount of $100 for 81 dys. at 6% = 101.35 517.66
Balance due, $304.37 *Ans.*

4. A note for $1670.50, dated July 1, 1884, payable on demand, with interest at 6½%, bears the following indorsements: Aug. 20, $315; Sept. 21, $360.50; Oct. 5, $400; Dec. 1, $160. What is due Jan. 1, 1885?

Amount of $1670.50 for ½ yr. at 6½% = $1724.79
Amount of $315 for 131 dys. at 6½% = $322.45
Amount of $360.50 for 100 dys. at 6½% = 367
Amount of $400 for 86 dys. at 6½% = 406.21
Amount of $160 for 30 dys. at 6½% = 160.87 1256.53
Balance due, $468.26 *Ans.*

Ex. 151. Page 243.

1. A note of $1000, dated Jan. 22, 1884, and drawing interest at 6%, had payments indorsed upon it as follows: May 20, 1884, $50; July 20, 1884, $162.50; Dec. 23, 1884, $72.50. Find the balance due March 1, 1885.

yrs.	mos.	dys.	
1884	5	20	
1884	1	22	
	3	28	$0.019\frac{2}{3}$
	$50.		
1884	7	20	
1884	5	20	
	2		0.01
	$162.50.		
1884	12	23	
1884	7	20	
	5	3	0.0255
	$72.50.		
1885	3	1	
1884	12	23	
	2	8	$0.011\frac{1}{3}$

$1000
$0.019\frac{2}{3}$
$19.67
1000.00
$1019.67
50.00
$969.67
0.01
$9.70
969.67
$979.37
162.50
$816.87
0.0255
$20.83
816.87
$837.70
72.50
$765.20
$0.011\frac{1}{3}$
$8.67
765.20
$773.87 *Ans.*

2. A note of $3325, dated Jan. 15, 1884, and drawing interest at 6½%, had payments indorsed upon it as follows: June 24, 1884, $100; Sept. 2, 1884, $1250; Jan. 31, 1885, $1400. Find the balance due May 12, 1886.

yrs.	mos.	dys.		
				$3325
1884	6	24		0.026½
1884	1	15		12)$88.11
	5	9	0.026½	7.34
	$100.			$95.45
				3325.00
				$3420.45
				100.00
				$3320.45
1884	9	2		0.011⅓
1884	6	24		12)$37.63
	2	8	0.011⅓	3.14
				$40.77
	$1250.			3320.45
				$3361.22
				1250.00
				$2111.22
				0.0248⅓
1885	1	31		12)$52.43
1884	9	2		4.37
	4	29	0.0248⅓	$56.80
	$1400.			2111.22
				$2168.02
				1400.00
				$768.02
				0.0768⅓
1886	5	12		12)$59.01
1885	1	31		4.92
1	3	11	0.0768⅓	$63.93
				768.02
				$831.95 *Ans.*

3. A note of $2280, dated Jan. 22, 1883, and drawing interest at 7% had payments indorsed upon it as follows: Jan. 10, 1884, $1000; Aug. 31, 1884, $250; Jan. 15, 1885, $600; March 4, 1885, $430. Find the balance due Jan. 15, 1885.

				$2280
yrs.	mos.	dys.		0.058
1884	1	10		6)$132.24
1883	1	22		22.04
	11	18	0.058	$154.28
				2280.00
	$1000.			$2434.28
				1000.00
				$1434.28
				0.385
1884	8	31		6)$55.22
1884	1	10		9.20
	7	21	0.0385	$64.42
				1434.28
				$1498.70
	$250.			250.00
				$1248.70
				0.22⅓
1885	1	15		6)$27.89
1884	8	31		4.65
				$32.54
	4	14	0.022⅓	1248.70
				$1281.24
	$600.			600.00
				$681.24
				0.008⅙
				6)$5.56
1885	3	4		0.93
1885	1	15		$6.49
				681.24
	1	19	0.008⅙	$687.73
				430.00
	$430.			$257.73
				0.0168⅓
				6)$4.34
				0.72
1885	6	15		$5.06
1885	3	4		257.73
	3	11	0.0168⅓	$262.79 *Ans.*

Ex. 152. Page 244.

1. Find the compound interest n $125 for 3 yrs., at 2½%.

$125
0.025
$3.125
125.000
$128.125
0.025
$3.203
128.125
$131.328
0.025
$3.283
131.328
$134.61
125.00
$9.61 *Ans.*

2. Find the amount of $87.50 or 3 yrs., at 4% per annum, at ompound interest.

$87.50
0.04
$3.50
87.50
$91.00
0.04
$3.64
91.00
$94.64
0.04
$3.785
94.64
$98.43 *Ans.*

3. Compare the simple and the mpound interest on $21.50, at e end of 4 yrs., at 5%.

$21.50
0.2
$4.30 simple interest.

$21.50
0.05
$1.075
21.500
$22.575
0.05
$1.12875
22.575
$23.704
0.05
$1.1852
23.704
$24.89
0.05
$1.244
$24.89
$26.13
21.50
$4.63 *Ans.*

4. What will a debt of $4250 amount to, if left standing for 2 yrs. 6 mos., at 5% per annum, compound interest?

$4250
0.05
$212.50
4250.00
$4462.50
0.05
$223.125
4462.50
$4685.625
0.025
$117.1406
4685.625
$4802.77 *Ans.*

5. Find the compound interest on $104 for 1 yr. 9 mos., at 5%.

$104
0.05
$5.20
104.00
$109.20
0.0375
$4.095
109.20
$113.29
104.00
$9.29 *Ans.*

6. Find the compound interest on $1800 for 2 yrs. 3 mos. 15 dys., at 3½%.

$1800
0.035
$63
1800
$1863
0.035
$65.20
1863
$1928.20
0.01021
$19.686
1928.20
$1947.89
1800.00
$147.89 *Ans.*

7. Find the compound interest on $4500 for 3 yrs. 6 mos., at 4%.

$4500
0.04
$180.00
4500.00
$4680.00
0.04
$187.20
4680.00
$4867.20
0.04
$194.688
4867.20
$5061.89
0.02
$101.237
5061.89
$5163.13
4500.00
$663.13 *Ans.*

8. Find the compound interest on $4000 for 2 yrs. 6 mos., at 5% per annum, interest payable semi-annually.

$4000
0.025
$100.00
4000.00
$4100.00
0.025
$102.50
4100.00
$4202.50
0.025
$105.06
4202.50
$4307.56
0.025
$107.69
4307.56
$4415.25
0.025
$110.38
4415.25
$4525.63
4000.
$525.63 *Ans.*

9. Find the compound interest on $1001.50 for 1 yr. 3 mos., at 6%, interest payable semi-annually.

$1001.50
0.03
$30.045
1001.50
$1031.545
0.03
$30.95
1031.54
$1062.49
0.015
$15.94
1062.49
$1078.43
1001.50
$76.93

$76.93. *Ans.*

10. Find the compound interest on $4000 for 1 yr. 3 mos., at 4% per annum, interest payable quarterly.

$4000
0.01
$40.00
4000.00
$4040.00
0.01
$40.40
4040.00
$4080.40
0.01
$40.804
$4080.40
$4121.204
0.01
$41.2120
4121.204
$4162.42
0.01
$41.624
4162.42
$4204.04
4000.
$204.04

$204.04. *Ans.*

11. What principal will amount to $275.62 in 2 yrs., at 5% compound interest?

Amount of $1 for 1 yr. at 5% is 1.05 × $1.
Amount of $1 for 2 yrs. is 1.05 × 1.05 × $1 = $(1.05)^2$ × $1.
That is, the amount of $1 for 2 yrs. at 5% is $1.1025.
The principal required is $275.62 ÷ 1.1025 = $250. *Ans.*

12. What principal will amount to $620.32 in 3 yrs., at 6% compound interest?

Amount of $1 for 1 yr. at 6% is 1.06 × $1.
Amount of $1 for 3 yrs. is 1.06 × 1.06 × 1.06 × $1 = $(1.06)^3$ × $1.
That is, the amount of $1 for 3 yrs. at 6% is $1.19102.
The principal required is $620.32 ÷ 1.19102 = $520.83. *Ans.*

13. Find the amount due May 17, 1885, on a note dated May 17, 1881, for $700, at 6% annual interest.

yrs.	mos.	dys.
1885	5	17
1881	5	17
4		

Principal = $700.00

Interest on principal for 1 yr. = 0.06 × $700 = $42.

Interest on principal for 4 yrs. = 4 × $42. = 168.00

Interest on interest for 3 + 2 + 1 yrs. = 6 yrs. = 6 × 0.06 × $42 = 15.12

Ans. $883.12

14. Find the amount due May 27, 1885, on a note dated Jan. 4, 1883, for $431, at 5½% annual interest.

yrs.	mos.	dys.
1885	5	27
1883	1	4
2	4	23

yrs.	mos.	dys.
1	4	23
	4	23
1	9	16

Principal = $431.00

Interest on principal for 1 yr. = 0.055 × $431 = $23.705.

Interest on interest for 1 yr. 9 mos. 16 dys. = 0.0986 × $23.705 = 2.33

Interest on principal for

2 yrs. 4 mos. 23 dys. $= \frac{5\frac{1}{2}}{6}$ of $0.01438\frac{1}{3} \times$ $431 = 56.83

Ans. $490.16

15. Find the amount due May 19, 1885, on a note dated Dec. 26, 1881, for $612.30, at 5% annual interest.

yrs.	mos.	dys.
1885	5	19
1881	12	26
3	4	23

yrs.	mos.	dys.
2	4	23
1	4	23
	4	23
4	2	9

Principal = $612.30

Interest on principal for 1 yr. = 0.05 × $612.30 = $30.615.

Interest on interest for

4 yrs. 2 mos. 9 dys. $= \frac{5}{6}$ of 0.2515 × $30.615 = 6.41

Interest on principal for

3 yrs. 4 mos. 23 dys. $= \frac{5}{6}$ of $0.2038\frac{1}{3} \times$ $612.30 = 104.01

Ans. $722.72

16. Find the amount due Jan. 16, 1885, on a note dated Jan. 8, 1883, for \$623.04, at 5% annual interest.

yrs.	mos.	dys.
1885	1	16
1883	1	8
2	0	8

yr.	mos.	dys.
1	0	8
		8
1	0	16

Principal = \$623.04

Interest on principal for 1 yr. = $0.05 \times \$623.04 = \$31.152$.

Interest on interest for 1 yr. 16 dys. = $0.052\frac{2}{9} \times \$31.152$ = 1.62

Interest on principal for 2 yrs. 8 dys. = $0.101\frac{1}{9} \times \$623.04$ = 63.00

Ans. \$687.66

17. Find the amount due Jan. 18, 1885, on a note dated Jan. 8, 1881, for \$575, at 6% annual interest.

yrs.	mos.	dys.
1885	1	18
1881	1	8
4	0	10

yrs.	mos.	dys.
3	0	10
2	0	10
1	0	10
		10
6	1	10

Principal. = \$575.00

Interest on principal for 1 yr. = $0.06 \times \$575 = \$34.50$.

Interest on interest for 6 yrs. 1 mo. 10 dys. = $0.366\frac{2}{3} \times \$34.50$ = 12.65

Interest on principal for 4 yrs. 10 dys. = $0.241\frac{2}{3} \times \$575$ = 138.96

Ans. \$726.61

Ex. 153. Page 248.

1. Find the cost of \$5000 stock, at 98.

Par value of share = \$100.

$$\text{Number of shares} = \frac{\$5000}{\$100} = 50.$$

Cost of stock = $50 \times \$98 = \$4900$. *Ans.*

2. Find the cost of \$7800 stock, at 78$\frac{1}{8}$.

Par value of share = \$100.

$$\text{Number of shares} = \frac{\$7800}{\$100} = 78.$$

Cost of stock = $78 \times \$78.12\frac{1}{2} = \$6093.75$. *Ans.*

3. Find the cost of $20,000 stock, at 109⅞.

Par value of stock = $100.

Number of shares $= \frac{\$20000}{\$100} = 200.$

Cost of stock = 200 × $109.87½ = $21,975. *Ans.*

4. Find the cost of $5000 United States 4% bonds, at 121.

Par value of bond = $100.

Number of bonds $= \frac{\$5000}{\$100} = 50.$

Cost of bonds = 50 × $121 = $6050. *Ans.*

5. Mr. Jones owns 20 United States 4% bonds of $1000 each. The interest on these bonds is paid quarterly. How much interest does Mr. Jones receive every quarter?

Par value of bonds = 20 × $1000 = $20000.
Interest for 1 yr. = 0.04 × $20000 = $800.
Interest for ¼ yr. $= \$\frac{800}{4} = \$200.$ *Ans.*

6. Find the cost of 20 shares of Boston and Maine Railroad stock, at 174.

Cost of 1 share = $174.
Cost of 20 shares = 20 × $174 = $3480. *Ans.*

7. How much of United States 4% bonds may be bought for $6305, at 121¼?

If 1 bond cost $121.25, number of bonds $= \frac{\$6305}{\$121.25} = 52.$

52 bonds at $100 each = $5200. *Ans.*

8. How much of Northern Pacific 6% bonds, selling at 102¾, may be bought for $10,275?

If 1 bond cost $102.75, number of bonds $= \frac{\$10275}{\$102.75} = 100.$

100 shares at $100 each = $10,000. *Ans.*

9. How many shares ($100 each) of Old Colony Railroad, at 137½, may be bought for $1650?

If 1 share cost $137.50, number of shares $= \frac{\$1650}{\$137.50} = 12.$ *Ans.*

10. How many shares of railroad stock, at $91\frac{1}{8}$, may be bought for $\$8474.62\frac{1}{2}$?

If 1 share cost \$91.125, number of shares $= \dfrac{\$8474.625}{\$91.125} = 93$. *Ans.*

11. What must be the price of stock in order that \$9200 stock may be bought for \$8970?

If \$9200 stock cost \$8970, \$1 stock costs $\dfrac{\$8970}{9200} = \$0.97\frac{1}{2}$.

Price of stock $= 97\frac{1}{2}$. *Ans.*

12. What must be the price of stock in order that \$11,600 stock may be bought for \$8729?

If \$11600 stock cost \$8729, \$1 stock costs $\dfrac{\$8729}{11600} = \$0.75\frac{1}{4}$.

Price of stock, $75\frac{1}{4}$. *Ans.*

13. If \$3000 stock is bought for \$2748.75, what is the price of the stock?

If \$3000 stock cost \$2748.75, \$1 stock costs $\dfrac{\$2748.75}{3000} = \$0.91\frac{5}{8}$.

Price of stock, $91\frac{5}{8}$. *Ans.*

14. What income will be derived from \$15,000 of 5% bonds?

Interest on \$15000 for 1 yr. at $5\% = 0.05 \times \$15000 = \$750$. *Ans.*

15. Find the income from \$9000 of 6% stock.

Interest on \$9000 for 1 yr. at $6\% = 0.06 \times \$9000 = \$540$. *Ans.*

16. How much will a person receive from \$18,800 railroad stock, if a dividend of 7% be declared?

7% of $\$18800 = 0.07 \times \$18800 = \$1316$. *Ans.*

17. What income will be derived from \$30,000 of 4% bonds?

4% of $\$30000 = 0.04 \times \$30000 = \$1200$. *Ans.*

18. How much 4% stock must be bought to give an income of \$2400?

\$1 gives an income of \$0.04.

\$2400 income requires $\dfrac{\$2400}{0.04} = \$60{,}000$. *Ans.*

19. A person receives \$343 as his quarterly dividend from a 7% stock. How much stock does he hold?

\$343 a quarter = 4 × \$343 = \$1372 a year.

If \$1372 = 7% of stock, stock $= \frac{100 \times \$1372}{7} = \$19{,}600$. *Ans.*

20. Find the entire income of a person whose property consists of \$6000 of 6% stock and \$16,400 of 7% stock.

\$6000 at 6% = \$ 360
\$16400 at 7% = 1148
Income = \$1508 *Ans.*

21. Find the rate of dividend paid by a railroad when a holder of 246 shares receives \$1722.

Value of 1 share = \$100.

Income from 1 share $= \frac{\$1712}{246} = \$7$.

If \$100 yields \$7, rate = 7%. *Ans.*

22. Find the rate per cent at which \$22,200 will yield a semi-annual return of \$999.

\$999 semi-annually = \$1998 a year.
Rate $= \frac{1998}{22200} = 0.09 = 9\%$. *Ans.*

23. Find the income on \$39,000 invested in 4% stock, at 91.

\$1 stock costs 0.91 of \$1.

\$39000 buys $\frac{\$39000}{0.91} = \$42857.14$ stock.

4% on \$42857.14 = 0.04 × \$42857.14 = \$1714.28. *Ans.*

24. Find the income on \$7000 invested in 4% stock, at 103¼.

\$1 stock costs 1.03¼ of \$1.

\$7000 buys $\frac{\$7000}{1.0325} = \$6779.65$ stock.

4% on \$6779.65 = 0.04 × \$6779.65 = \$271.19. *Ans.*

25. Find the income on \$13,600 invested in 7% stock, at 130.

\$1 stock costs 1.30 of \$1.

\$13600 buys $\frac{\$13600}{1.30} = \$10461.54$ stock.

7% on \$10461.54 = \$732.30. *Ans.*

26. A person invests \$14,280 in railroad stock, at $127\frac{1}{2}$. What will he receive if a dividend of $3\frac{1}{4}\%$ be declared?

\$1 stock costs $1.27\frac{1}{2}$ of \$1.

\$14280 buys $\frac{\$14280}{1.275} = \$11200$ stock.

$3\frac{1}{4}\%$ of $\$11200 = 0.03\frac{1}{4} \times \$11200 = \$364$. *Ans.*

27. Find the income on \$14,000 when invested in 8% stock, at $103\frac{1}{4}$.

\$1 stock costs $1.03\frac{1}{4}$ of \$1.

\$14000 buys $\frac{\$14000}{1.0325} = \$13559.32$ stock.

8% on $\$13559.32 = 0.08 \times \$13559.32 = \$1084.75$. *Ans.*

28. If an 8% stock is worth 150, what rate of interest will a purchaser receive on his money?

\$100 stock costs \$150. \$150 investment pays \$8.
\$100 stock pays \$8. Rate $= \frac{8}{150} = 0.05\frac{1}{3} = 5\frac{1}{3}\%$. *Ans.*

29. If a 10% stock is worth 175, what rate of interest will a purchaser receive on his money?

\$100 stock costs \$175. \$175 investment pays \$10.
\$100 stock pays \$10. Rate $= \frac{10}{175} = 0.05\frac{5}{7} = 5\frac{5}{7}\%$. *Ans.*

30. If a 9% stock is worth 170, what rate of interest will a purchaser receive on his money?

\$100 stock costs \$170. \$170 investment pays \$9.
\$100 stock pays \$9. Rate $= \frac{9}{170} = 0.05\frac{5}{17} = 5\frac{5}{17}\%$. *Ans.*

31. If a 4% stock is worth 70, what rate of interest will a purchaser receive on his money?

\$100 stock costs \$70. \$70 investment pays \$4.
\$100 stock pays \$4. Rate $= \frac{4}{70} = 0.05\frac{5}{7} = 5\frac{5}{7}\%$. *Ans.*

32. If a 3% stock is worth 65, what rate of interest will a purchaser receive on his money?

\$100 stock costs \$65. \$65 investment pays \$3.
\$100 stock pays \$3. Rate $= \frac{3}{65} = 0.04\frac{8}{13} = 4\frac{8}{13}\%$. *Ans.*

33. How much money must be invested in 8% stock, at 92, to produce $400 income?

$8 is received from $100 stock.
$400 will be received from $\frac{400}{8} \times \$100$ stock $= \$5000$ stock.
$100 stock costs $92.
Therefore $5000 stock costs $50 \times \$92 = \$4600$. *Ans.*

34. How much money must be invested in a 3% stock, at 87½, to produce an income of $250?

$3 is received from $100 stock.
$250 will be received from $\frac{250}{3} \times \$100$ stock $= \$8333.33$.
$100 stock costs $87½.
$8333.33 stock costs $\frac{8333.33}{100} \times \$87.50 = \$7291.67$. *Ans.*

35. A person bought some bank stock at 107, and received $265 when a 5% dividend was declared by the bank. How much money had he invested?

Number of shares at $5 a share $= \frac{265}{5} = 53$.
53 shares at $107 a share $= 53 \times \$107 = \$5671$. *Ans.*

36. A person buys some 6% railroad stock at 75, and receives $750 income. How much money has he invested?

Number of shares at $6 a share $= \frac{750}{6} = 125$.
125 shares at $75 a share $= 125 \times \$75 = \$9375$. *Ans.*

37. What must be the price of a 6% stock in order that a buyer may receive 7% on his investment?

$100 must be invested to produce $7.
Hence $\frac{6}{7}$ of $100 $= \$85\frac{5}{7}$ must be invested to produce $6.
The price of the 6% stock $= 85\frac{5}{7}$. *Ans.*

38. What must be the price of an 8% stock in order that a buyer may receive 6% on his investment?

$100 must be invested to produce $6.
Hence $\frac{8}{6}$ of $100 $= \$133\frac{1}{3}$ must be invested to produce $8.
Price of the 8% stock $= 133\frac{1}{3}$. *Ans.*

39. A person invested $5710 in bank stock when the stock was at $142\frac{3}{4}$. What per cent dividend is declared, if he receives $300?

$$\text{Par value of stock} = \frac{100 \times \$5710}{142\frac{3}{4}} = \$4000.$$

$\frac{300}{4000} = 0.07\frac{1}{2} = 7\frac{1}{2}\%$. *Ans.*

40. A person receives 5% interest on his money by investing in some six per cent stock. At what price did he buy it?

$100 must be invested to produce $6.
Hence $\frac{6}{5}$ of $100 = $120 must be invested to produce $6.
Price of the 5% stock = 120. *Ans.*

41. What must be the price of a 7% stock in order that a buyer may receive 6% on his investment?

$100 must be invested to produce $6.
Hence $\frac{7}{6}$ of $100 = $$116\frac{2}{3}$ must be invested to produce $7.
Price of the 7% stock = $116\frac{2}{3}$. *Ans.*

Ex. 154. Page 253.

1. Find the cost of a draft on New York for $1200, at $\frac{1}{4}$ of 1% discount.

$\frac{1}{4}\%$ of $1200 = $3 (discount). $1200 − $3 = $1197 (cost). *Ans.*

2. Find the cost of a draft on St. Louis for $2000, at $\frac{1}{4}$ of 1% premium.

$\frac{1}{4}\%$ of $2000 = $5 (premium). $2000 + $5 = $2005 (cost). *Ans.*

3. Find the cost of a draft on New Orleans for $2400, at $\frac{1}{8}\%$ premium.

$\frac{1}{8}\%$ of $2400 = $3 (premium). $2400 + $3 = $2403 (cost). *Ans.*

4. Find the cost of a draft on Chicago for $3200, at $\frac{3}{8}\%$ discount.

$\frac{3}{8}\%$ of $3200 = $12 (discount). $3200 − $12 = $3188 (cost). *Ans.*

5. Find the cost of a draft for $800, payable 30 dys. after sight, when exchange is $\frac{1}{4}\%$ premium, and interest 6%.

$$\begin{array}{lcl}
 & & \$800.00 \\
0.0055 \text{ of } \$800 & = & \underline{4.40} \text{ discount for 33 dys.} \\
 & & \$795.60 \text{ cost of draft at par.} \\
\frac{1}{4}\% \text{ of } \$800 & = & \underline{2.00} \text{ premium.} \\
 & & \$797.60 \text{ cost of draft. } \textit{Ans.}
\end{array}$$

6. Find the cost of a draft for $1900, payable in 30 dys., when exchange is at par, and interest 4½ %.

$$\begin{array}{lrl} & \$1900.00 & \\ 0.0041\tfrac{1}{4} \text{ of } \$1900 = & \underline{7.84} & \text{discount for 33 dys.} \\ & \$1892.16 & \text{cost of draft. } \textit{Ans.} \end{array}$$

7. Find the cost of a draft for $1450, payable in 60 dys. when exchange is ¼ % discount, and interest 5 %.

$$\begin{array}{lrl} & \$1450.00 & \\ 0.00875 \text{ of } \$1450 = & \underline{12.69} & \text{discount for 63 dys.} \\ & \$1437.31 & \text{cost of draft at par.} \\ \tfrac{1}{4}\% \text{ of } \$1450 \quad = & \underline{3.63} & \text{discount.} \\ & \$1433.68 & \text{cost of draft. } \textit{Ans.} \end{array}$$

8. Find the cost of a draft for $1000, payable 60 dys. after sight, when exchange is ½ % discount, and interest 7 %.

$$\begin{array}{lrl} & \$1000.00 & \\ 0.01225 \text{ of } \$1000 = & \underline{12.25} & \text{discount for 63 dys.} \\ & \$987.75 & \text{cost of draft at par.} \\ \tfrac{1}{2}\% \text{ of } \$1000 \quad = & \underline{5.00} & \text{discount.} \\ & \$982.75 & \text{cost of draft. } \textit{Ans.} \end{array}$$

Ex. 155. Page 258.

1. An express-train runs 40 mi. in 64 min. At the same rate, how many miles will it run in 24 min.?

64 min. : 24 min. : : 40 mi. : ?

64 : 24 : : 40 : ?

$$\frac{\overset{3}{\cancel{24}} \times \overset{5}{\cancel{40}}}{\underset{\cancel{8}}{\cancel{64}}} = 15. \quad \textit{Ans.}$$

2. If 110 A. produce 200 hhds. of sugar, how many hogsheads will 176 A. produce?

110 A : 176 A : : 200 hhds. : ?

110 : 176 : : 200 : ?

$$\frac{\overset{16}{\cancel{176}} \times \overset{20}{\cancel{200}}}{\underset{\cancel{11}}{\cancel{110}}} = 320. \quad \textit{Ans.}$$

3. If 48 reapers cut 20 A. in a given time, how many acres will 156 reapers cut in the same time?

48 reapers : 156 reapers : : 20 A : ?

48 : 156 : : 20 : ?

$$\frac{\overset{13}{\cancel{156}} \times \overset{5}{\cancel{20}}}{\underset{\cancel{4}}{\cancel{48}}} = 65. \quad \textit{Ans.}$$

4. If 20 reapers can cut a field in 6 dys., in how many days will 30 reapers do it?

30 reapers : 20 reapers : : 6 dys. : ?

30 : 20 : : 6 : ?

$$\frac{\overset{4}{\cancel{20}} \times \cancel{6}}{\underset{5}{\cancel{30}}} = 4.\ \textit{Ans.}$$

5. The number of copies in the first edition of the "Lady of the Lake" was 2050, and was to the number in the second as 41 to 69. Find the number in the second edition.

41 : 69 : : 2050 : ?

$$\frac{69 \times \overset{50}{\cancel{2050}}}{\cancel{41}} = 3450.\ \textit{Ans.}$$

6. The length of the steamer-track from Liverpool to Quebec is 2502 mi. and is to that from Liverpool to Boston as 139 is to 155. Find the length of the track from Liverpool to Boston.

139 : 155 : : 2502 mi. : ?

$$\frac{155 \times \overset{18}{\cancel{2502}}}{\cancel{139}} = 2790 \text{ mi. } \textit{Ans.}$$

7. If a steamer from Liverpool to Portland makes the passage of 2750 mi. in $5\frac{5}{8}$ dys., in how many days, at the same rate, would the passage of 2980 mi. from Liverpool to New York have been made?

2750 mi. : 2980 mi. : : $5\frac{5}{8}$ dys. : ?

2750 : 2980 : : $5\frac{5}{8}$: ?

$$\frac{\overset{298}{\cancel{2980}} \times \overset{1\frac{1}{8}}{\cancel{5\frac{5}{8}}}}{\underset{\underset{55}{\cancel{275}}}{\cancel{2750}}} = 6\tfrac{21}{220}.\ \textit{Ans.}$$

8. If a person can walk $8\frac{4}{7}$ mi. in $2\frac{1}{2}$ hrs., how many miles can he walk in $3\frac{1}{4}$ hrs.?

$2\frac{1}{2}$ hrs. : $3\frac{1}{4}$ hrs. : : $8\frac{4}{7}$ mi. : ?

$2\frac{1}{2}$: $3\frac{1}{4}$: : $8\frac{4}{7}$: ?

$\frac{10}{4}$: $\frac{13}{4}$: : $\frac{60}{7}$: ?

10 : 13 : : $\frac{60}{7}$: ?

$$\frac{13 \times \overset{\frac{6}{7}}{\cancel{\tfrac{60}{7}}}}{\cancel{10}} = \tfrac{78}{7} = 11\tfrac{1}{7}.\ \textit{Ans.}$$

9. If the shadow of a staff 3 ft. 7 in. high is 4 ft. 9 in., find the height of a steeple whose shadow is 158 ft. 4 in.

$4\frac{9}{12}$ ft. : $158\frac{4}{12}$ ft. : : $3\frac{7}{12}$ ft. : ?

57 in. : 1900 in. : : 43 in. : ?

$$\frac{\overset{100}{\cancel{1900}} \times 43}{\underset{3}{\cancel{57}}} = 1433\tfrac{1}{3}.$$

$1433\frac{1}{3}$ in. = $119\frac{4}{9}$ ft. *Ans.*

10. A train, at the rate of $25\frac{3}{8}$ mi. an hour, goes a certain distance in $3\frac{1}{2}$ hrs. In how many hours will one at the rate of $24\frac{1}{2}$ mi. an hour go the same distance?

$24\frac{1}{2}$ mi. : $25\frac{3}{8}$ mi. : : $3\frac{1}{2}$ hrs. : ?

$24\frac{1}{2}$: $25\frac{3}{8}$: : $3\frac{1}{2}$: ?

196 : 203 : : $3\frac{1}{2}$: ?

$$\frac{203 \times 3\frac{1}{2}}{196} = 3\tfrac{5}{8}.\ \textit{Ans.}$$

11. The ratio of the diameter to the circumference of a circle was given by Metius as 113 : 355. Find the circumference of a fly-wheel 10 ft. in diameter.

113 : 355 : : 10 ft. : ?

$$\frac{355 \times 10}{113} = 31.4159.\ \textit{Ans.}$$

13. If 1000 sq. yds. of a field produce a load of hay, how many such loads will 25 A. of the field produce?

1000 sq. yds. : 25 A : : 1 load : ?
1000 sq. yds. : 121000 sq. yds. : 1 load : ?
1000 : 121000 : : 1 : ?

$$\frac{121000 \times 1 \text{ load}}{1000} = 121 \text{ loads. } \textit{Ans.}$$

14. If a train runs 177 mi. 120 rds. in 3 hrs. 56½ min., what is the rate per hour?

3 hrs. 56½ min. : 1 hr. : : 177 mi. 120 rds. : ?
236½ min. : 60 min. : : 56760 rds. : ?

236½ : 60 : : 56760 : ? $\quad \frac{60 \times 56760}{236\frac{1}{2}} = 14400.$

14400 rds. = 45 mi. *Ans.*

15. If 136 masons can build a fort in 28 dys., how many men will be required to build it in 8 dys.?

8 dys. : 28 dys. : : 136 : ?
8 : 28 : : 136 : ?

$$\frac{28 \times \overset{17}{\cancel{136}}}{\cancel{8}} = 476. \ \textit{Ans.}$$

16. There are provisions in a fort sufficient to support 4000 soldiers for 3 mos. How many must be sent away to make them last 8 mos.?

8 mos. : 3 mos. : : 4000 : number of men the food will support.
8 : 3 : : 4000 : number of men the food will support.

$$\frac{3 \times \overset{500}{\cancel{4000}}}{\cancel{8}} = 1500.$$

4000 – 1500 = 2500 men to be sent away. *Ans.*

17. A coach travels 7½ mi. an hour. How many miles will it go between a quarter past ten A.M. and a quarter to six P.M.?

From 10¼ A.M. to 5¾ P.M. = 7½ hrs.
1 hr. : 7½ hrs. : : 7½ mi. : ? $\quad$ 1 : 7½ : : 7½ : ?

$$\frac{7\frac{1}{2} \times 7\frac{1}{2}}{1} = 56\tfrac{1}{4}. \ \textit{Ans.}$$

18. The expense of making the hay on 5 A. 135 sq. rds. is $29.08. What is the expense per acre?

5 A. 135 sq. rds. : 1 A. : : $29.08 : ?

935 sq. rds. : 160 sq. rds. : : $29.08 : ?

935 : 160 : : 29.08 : ? $\qquad \dfrac{160 \times \$29.08}{935} = \$4.98.$ *Ans.*

19. If 300 laborers can make an embankment in 48 dys., how many more days would be required if the number of men is diminished by 60?

$300 - 60 = 240 =$ men employed.

240 : 300 : : 48 : ? $\qquad \dfrac{\overset{5}{\cancel{300}} \times \overset{12}{\cancel{48}}}{\underset{4}{\cancel{240}}} = 60$ (days required).

$60 - 48 = 12$ (more days required). *Ans.*

20. If 2.45 tons of straw cost $22.75, how many tons can be bought for $11.70?

$22.75 : $11.70 : : 2.45 : ? $\qquad \dfrac{11.70 \times 2.45}{22.75} = 1.26.$ *Ans.*

Ex. 156. Page 261.

1. If 13 bu. of oats serve 3 horses for 11 dys., how many bushels will serve 7 horses for 12 dys.?

$$\begin{array}{l}3:7\\11:12\end{array} :: 13 : ? \qquad \frac{7 \times \overset{4}{\cancel{12}} \times 13}{\cancel{3} \times 11} = \frac{364}{11} = 33\tfrac{1}{11}.\ \textit{Ans.}$$

2. If a traveller walks 140 mi. in 8 dys., walking 7 hrs. a day, how many miles can he walk in 12 dys. of 8 hrs. each?

$$\begin{array}{l}8:12\\7:80\end{array} :: 140 : ? \qquad \frac{\cancel{8} \times 12 \times \overset{20}{\cancel{140}}}{\cancel{7} \times \cancel{8}} = 240.\ \textit{Ans.}$$

3. If 4 masons build 27 yds. of wall in 5 dys., working 9 hrs. a day, in how many days will 32 masons build 81 yds. of a similar wall, if they work 10 hrs. a day?

$$\begin{array}{l}32:4\\27:81\\10:9.\end{array} :: 5 : ? \qquad \frac{\cancel{4} \times \overset{3}{\cancel{81}} \times 9 \times \cancel{5}}{\underset{8}{\cancel{32}} \times \cancel{27} \times \underset{2}{\cancel{10}}} = \frac{27}{16} = 1\tfrac{11}{16}.\ \textit{Ans.}$$

4. A bootmaker who employs 15 men fills an order for 25 doz. pairs of boots in 4 wks. In how many days can he make 45 pairs if he employs 18 men?

$$\left.\begin{array}{r}18:15\\300:45\end{array}\right.::24:?\qquad\frac{\cancel{15}\times\overset{\cancel{5}}{\cancel{45}}\times 24}{\underset{2}{\cancel{18}}\times\underset{\underset{4}{\cancel{20}}}{\cancel{300}}}=\frac{24}{8}=3.\ \textit{Ans.}$$

5. If a family, by using 2 gas-burners 7½ hrs. a day, pays $6 a quarter when gas is $2.40 per 1000 cu. ft., what will a family using 3 burners 4 hrs. a day pay per quarter when gas is $1.80 per 1000 cu. ft.?

$$\left.\begin{array}{r}2:3\\7\frac12:4\\2.40:1.80.\end{array}\right.::6:?\qquad\frac{3\times\overset{2}{\cancel{4}}\times 1.80\times\cancel{6}}{\cancel{2}\times 7\frac12\times\underset{0.40}{\cancel{2.40}}}=3.60.\qquad \$3.60.\ \textit{Ans.}$$

6. If 330 slices $\frac{3}{14}$ of an inch thick are obtained from 12 rounds of beef, how many similar rounds will be required for 495 slices $\frac16$ of an inch thick?

$$\left.\begin{array}{r}330:495\\\frac{3}{14}:\frac16\end{array}\right.::12:?$$

$$\frac{495\times\frac16\times12}{330\times\frac{3}{14}}=\frac{\overset{\cancel{3}}{\cancel{495}}\times1\times\overset{2}{\cancel{12}}\times\overset{7}{\cancel{14}}}{\underset{\cancel{2}}{\cancel{330}}\times\cancel{3}\times\cancel{6}}=14.\ \textit{Ans.}$$

7. If 5 horses eat 8 bu. 14 qts. of oats in 9 dys., how many days, at the same rate, will 66 bu. 30 qts. last 17 horses?

8 bu. 14 qts. = 270 qts.; 66 bu. 30 qts. = 2142 qts.

$$\left.\begin{array}{r}17:5\\270:2142\end{array}\right.::9:?\qquad\frac{\cancel{5}\times\overset{\overset{21}{\cancel{357}}}{\cancel{2142}}\times\cancel{9}}{\cancel{17}\times\underset{\underset{\cancel{6}}{\cancel{54}}}{\cancel{270}}}=21.\ \textit{Ans.}$$

8. If a man walks 600 mi. in 25 dys., walking 8 hrs. a day, in how many days will he walk 330 mi., walking 10 hrs. a day?

$$\left.\begin{array}{r}600:330\\10:8\end{array}\right.::25:?\qquad\frac{\overset{11}{\cancel{330}}\times\cancel{8}\times\cancel{25}}{\underset{\underset{\cancel{3}}{\cancel{24}}}{\cancel{600}}\times\cancel{10}}=11.\ \textit{Ans.}$$

9. If a pane of glass 18 in. long and $12\frac{1}{2}$ in. wide costs 20 cts., what will be the cost, at the same rate, of a pane $22\frac{1}{2}$ in. long and 15 in. wide?

$$\left.\begin{matrix}12.5 : 15\\ 18 : 22.5\end{matrix}\right\} :: 20 : ? \qquad \frac{\overset{3}{\cancel{15}}\times\overset{9}{\cancel{22.5}}\times\overset{10}{\cancel{20}}}{\underset{\cancel{5}}{\cancel{12.5}}\times\underset{\cancel{2}}{\cancel{18}}} = 30. \qquad 30 \text{ cts. } \textit{Ans.}$$

10. If 18 men can dig a trench 200 yds. long, 3 yds. wide, and 2 yds. deep, in 6 dys. of 10 hrs. each, in how many days of 8 hrs. each will 10 men dig a trench 100 yds. long, 4 yds. wide, and 3 yds. deep?

$200 \times 3 \times 2 = 1200$ cu. yds.
$100 \times 4 \times 3 = 1200$ cu. yds.

$$\left.\begin{matrix}10 : 18\\ 8 : 10\end{matrix}\right\} :: 6 : ? \qquad \frac{\overset{9}{\cancel{18}}\times\cancel{10}\times\overset{3}{\cancel{6}}}{\cancel{10}\times\underset{\underset{2}{\cancel{4}}}{\cancel{8}}} = \frac{27}{2} = 13\tfrac{1}{2}. \ \textit{Ans.}$$

Ex. 157. Page 262.

1. Divide 1200 into parts proportional to 11, 12, 13, 14.

$11 + 12 + 13 + 14 = 50.$ $\frac{11}{50} = 264$; $\frac{12}{50} = 288$; $\frac{13}{50} = 312$; $\frac{14}{50} = 336$.
$\frac{50}{50} = 1200.$ $\frac{1}{50} = 24.$ 264; 288; 312; 336. *Ans.*

2. Divide 390 into parts proportional to $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$.

$\frac{1}{2}, \frac{1}{3}, \frac{1}{4} = \frac{6}{12}, \frac{4}{12}, \frac{3}{12}.$ $\frac{1}{13} = 30.$
$6 + 4 + 3 = 13.$ $\frac{6}{13} = 180$; $\frac{4}{13} = 120$; $\frac{3}{13} = 90.$
$\frac{13}{13} = 390.$ 180; 120; 90. *Ans.*

3. Divide a profit of \$689, among 3 partners, of whom the first owns $\frac{2}{13}$, the second $\frac{5}{13}$, and the third $\frac{6}{13}$ of the joint stock.

$2 + 5 + 6 = 13.$ $\frac{13}{13} = \$689.$ $\frac{1}{13} = \$53.$
$\frac{2}{13} = \$106$; $\frac{5}{13} = \$265$; $\frac{6}{13} = \$318.$
\$106; \$265; \$318. *Ans.*

4. Four men invest \$450, \$230, \$190, \$110 respectively in a joint business. Find their respective liabilities in a loss of \$313.60.

$45 + 23 + 19 + 11 = 98.$ $\frac{98}{98} = \$313.60.$ $\frac{1}{98} = \$3.20.$
$\frac{45}{98} = \$144$; $\frac{23}{98} = \$73.60$; $\frac{19}{98} = \$60.80$; $\frac{11}{98} = \$35.20.$
\$144; \$73.60; \$60.80; \$35.20. *Ans.*

5. Three partners claim respectively $\frac{1}{3}$, $\frac{11}{18}$, and $\frac{7}{18}$ of $1260. Give to each his proportional share.

$\frac{1}{3} = \frac{6}{18}$. $6 + 11 + 7 = 24$. $\frac{24}{24} = \$1260$. $\frac{1}{24} = \$52.50$.
$\frac{6}{24} = \$315$; $\frac{11}{24} = \$577.50$; $\frac{7}{24} = \$367.50$.
$315; $577.50; $367.50. *Ans.*

6. An analysis of dissolved bones gives the following results for every 100 parts. Water, 13.97; organic matter, 15.71; soluble phosphates, 21.63; insoluble phosphates, 11.43; sulphate of lime, 15.83; sulphuric acid, 15.63; alkaline salts, 1.10; silica, etc., the remainder. Find the number of pounds of each in a ton of dissolved bones.

$\frac{1}{100}$ of 2000 lbs. = 20 lbs.

$$\begin{array}{r} 13.97 \\ 15.71 \\ 21.63 \\ 11.43 \\ 15.83 \\ 15.63 \\ 1.10 \\ \hline 95.30 \end{array}$$

$100 - 95.30 = 4.70 =$ remainder.

$\frac{13.97}{100} =$ 279.4 lbs. water.
$\frac{15.71}{100} =$ 314.2 lbs. organic matter.
$\frac{21.63}{100} =$ 432.6 lbs. soluble phosphates.
$\frac{11.43}{100} =$ 228.6 lbs. insoluble phosphates.
$\frac{15.83}{100} =$ 316.6 lbs. sulphate of lime.
$\frac{15.63}{100} =$ 312.6 lbs. sulphuric acid.
$\frac{1.10}{100} =$ 22.0 lbs. alkaline salts.
$\frac{4.70}{100} =$ 94.0 lbs. remainder.
2000.0 lbs.

Ex. 158. Page 263.

1. Three drovers rent a field of 9 A., at $5 an acre. A puts in 6 cows for 2 mos.; B, 9 cows for 1 mo.; and C, 12 cows for 2 mos. How much should each pay?

9 A. at $5 per A. = $45.
A, 6 cows for 2 mos. = 12 cows for 1 mo.
B, 9 cows for 1 mo. = 9 cows for 1 mo.
C, 12 cows for 2 mos. = 24 cows for 1 mo.
45 cows for 1 mo.

For 45 cows is paid \$45, for 1 cow is paid \$1.
A, 12 × \$1 = \$12; B, 9 × \$1 = \$9; C, 24 × \$1 = \$24.
\$12; \$9; \$24. *Ans.*

2. In a co-partnership A contributed \$400 for 9 mos.; B, \$350 for 8 mos.; and C, \$600 for 2 mos. Divide a gain of \$570 among them.

A, 9 × \$400 = \$3600 A received $\frac{36}{76}$ or $\frac{9}{19}$ of \$570 = \$270.
B, 8 × \$350 = 2800 B received $\frac{28}{76}$ or $\frac{7}{19}$ of \$570 = \$210.
C, 2 × \$600 = 1200 C received $\frac{12}{76}$ or $\frac{3}{19}$ of \$570 = \$90.
\$7600 \$270; \$210; \$90. *Ans.*

3. At the end of 12 mos. A, B, and C, having a joint capital of \$6000, find they have lost \$625. A's capital of \$2500 has been in the business for 12 mos., B's of \$1500 for 8 mos., and C's of \$2000 for 4 mos. Divide the loss among them.

A, 12 × \$2500 = \$30000 A pays $\frac{30}{50}$ of \$625 = \$375.
B, 8 × \$1500 = 12000 B pays $\frac{12}{50}$ of \$625 = \$150.
C, 4 × \$2000 = 8000 C pays $\frac{8}{50}$ of \$625 = \$100.
\$50000 \$375; \$150; \$100. *Ans.*

4. A and B enter into partnership, A with \$1800, and B with \$900. At the end of 8 mos. B adds \$300 to his capital. Divide a profit of \$840 between them, at the end of the year.

A's share = \$1800
B's share = \$900
4 mos. = $\frac{1}{3}$ yr. $\frac{1}{3}$ of \$300 = \$100 \$1000
\$2800
A receives $\frac{18}{28} = \frac{9}{14}$ of \$840 = \$540.
B receives $\frac{10}{28} = \frac{5}{14}$ of \$840 = \$300.
\$540; \$300. *Ans.*

Ex. 159. Page 264.

1. A merchant mixes 3 lbs. of coffee worth 27 cts. a pound, 2 lbs. worth 35 cts., and 1 lb. worth 41 cts. What is the mixture worth a pound?

3 lbs. at 27 cts. = 81 cts.
2 35 = 70
1 41 = 41
6 lbs. = 192 cts.
1 lb. = 32 cts. *Ans.*

2. What is the cost of a gallon of a mixture containing 7 gals. worth \$1.35 a gallon, 5 gals. worth \$1.05 a gallon, and water enough to make the whole mixture 15 gals.?

$$\begin{array}{lrr} \text{7 gals. at } \$1.35 & = & \$9.45 \\ 5 \quad\quad 1.05 & = & 5.25 \\ 3 \quad\quad 0.00 & = & 0.00 \\ \hline \text{15 gals.} & = & \$14.70 \\ \text{1 gal.} & = & \$\ 0.98\ \textit{Ans.} \end{array}$$

3. Of 32 candidates for office, 3 were 20 yrs. old, 4 were 21, 12 were 22, 12 were 23, and 1, 24. What was the average age of the candidates?

$$\begin{array}{rcr} 3 \times 20 & = & 60 \\ 4 \times 21 & = & 84 \\ 12 \times 22 & = & 264 \\ 12 \times 23 & = & 276 \\ 1 \times 24 & = & 24 \\ \hline 32 & = & 708 \\ 1 & = & 22\frac{1}{8}\ \textit{Ans.} \end{array}$$

4. A bankrupt owes A \$962.50; B, \$3487; and C, \$12,686.50. His estate, after paying expenses of settlement, is \$3427.20. How much can he pay on a dollar?

$$\text{Debts} = \$962.50 + \$3487 + \$12{,}686.50 = \$17{,}136.$$

$$\text{Assets} = \$3427.50.$$

$$\frac{3427.50}{17136} = 0.20. \qquad \text{20 cts. on the dollar. } \textit{Ans.}$$

5. A grocer buys 106 lbs. of tea, at 80 cts. per pound, 75 lbs. at \$1.24 per pound, and 94 lbs. at \$1.30 per pound, and mixes the three lots together. At what price per pound must he sell the mixture so as to make 10% on his outlay?

$$\begin{array}{lrr} \text{106 lbs. at } \$0.80 & = & \$\ 84.80 \\ 75 \quad\quad 1.24 & = & 93.00 \\ 94 \quad\quad 1.30 & = & 122.20 \\ \hline \text{275 lbs.} & = & \$300.00 \end{array}$$

1 lb. costs $\$1.09\frac{1}{11}$.

10% of $\$1.09\frac{1}{11} = \$0.10\frac{10}{11}$.

$\$1.09\frac{1}{11} + \$0.10\frac{10}{11} = \$1.20$. *Ans.*

7. In what proportion must oils worth \$1.20 and 60 cts. a gallon be mixed, so that the mixture may be worth 70 cts. a gallon?

Loss on \$1.20 = 50 cts. Gain on \$0.60 = 10 cts.

Ratio = 10 : 50, or 1 : 5. *Ans.*

8. Solder is composed of tin and lead. If a solder weighs 10.44 times as much as an equal bulk of water, while tin weighs 7.29, and lead 11.35 as much, find the weight of each metal in a pound of solder.

Gain on tin = 10.44 – 7.29 = 3.15.

Loss on lead = 11.35 – 10.44 = 0.91.

Ratio = 3.15 : 0.91, or as more lead will be needed, 3.15 parts of lead to 0.91 parts of tin in 4.06 parts of solder.

Therefore the weight of tin is $\frac{91}{406}$ of $\frac{729}{1044}$ of 16 oz. = 2.504 oz., and the weight of lead is $\frac{315}{406}$ of $\frac{1135}{1044}$ of 16 oz. = 13.496 oz.

Tin, 2.504 oz.; lead, 13.496 oz. *Ans.*

9. Find the equated time for the payment of \$300 due in 3 mos., \$500 due in 6 mos., \$200 due in 9 mos.

\$300 for 3 mos. = \$900 for 1 mo.
500 for 6 mos. = 3000 for 1 mo.
200 for 9 mos. = 1800 for 1 mo.

\$1000 \$5700 for 1 mo.
$\frac{5700}{1000} = 5.7$. 5 mos. 21 dys. *Ans.*

10. A owes B \$50 payable in 6 mos., \$60 payable in 8 mos., and \$90 payable in 4 mos. Find the equated time of payment.

\$50 for 6 mos. = \$300 for 1 mo.
60 for 8 mos. = 480 for 1 mo.
90 for 4 mos. = 360 for 1 mo.

\$200 \$1140 for 1 mo.
$\frac{1140}{200} = 5.7$. 5 mos. 21 dys. *Ans.*

11. A owes B \$1000, payable at the end of 9 mos. He pays \$200 at the end of 3 mos. and \$300 at the end of 8 mos. When is the balance due?

\$1000 for 9 mos. = \$9000 for 1 mo.
200 for 3 mos. = 600 for 1 mo.
300 for 8 mos. = 2400 for 1 mo.

Due at the end of 9 mos. \$1000 – (\$200 + \$300) = \$1000 – \$500 = \$500.
\$600 + \$2400 = \$3000.
\$9000 – \$3000 = \$6000.
$\frac{6000}{500} = 12$. 12 mos. *Ans.*

12. On the first day of January, A purchases of B $200 worth of goods on 3 mos. credit, and $500 worth on 4 mos. credit, and gives one note in payment. When does the note become due?

$200 for 3 mos. = $600 for 1 mo.
$500 for 4 mos. = $2000 for 1 mo.
$700 $2600 for 1 mo.
$\frac{2600}{700} = 3.7$; or 3 mos. 21 dys.
Jan. 1 + 3 mos. 21 dys. = Apr. 22. *Ans.*

Ex. 160. Page 269.

1. Find the square root of 4225.

42 25(65
36
125)6 25
6 25

65. *Ans.*

2. Find the square root of 31.36.

31.36(5.6
25
106)6 36
6 36

5.6. *Ans.*

3. Find the square root of 50625.

5 06 25(225
4
42)1 06
84
445)22 25
22 25

225. *Ans.*

4. Find the square root of 401956.

40 19 56(634
36
123)4 19
3 69
1264)50 56
50 56

634. *Ans.*

5. Find the square root of 15.7609.

15.76 09(3.97
9
69)6 76
6 21
787)55 09
55 09

3.97. *Ans.*

6. Find the square root of 0.180625.

0.18 06 25(0.425
16
82)2 06
1 64
845)42 25
42 25

0.425. *Ans.*

7. Find the square root of 0.001296.

0.00 12 96(0.036
9
66)3 96
3 96

0.036. *Ans.*

8. Find the square root of 0.042849.

0.04 28 49(0.207
4
407)28 49
28 49

0.207. *Ans.*

9. Find the square root of 0.025.

0.025(0.15811
1
25)150
125
308)2500
2464
3161)3600
3161
31621)43900
31621

0.15811. *Ans.*

10. Find the square root of 28.75.

28.75(5.3619
25.
103)3 75
3 09
1066)6600
6396
10721)20400
10721
107229)967900
965061

5.3619. *Ans.*

11. Find the square root of 0.009.

0.00 90(0.09486
81
184)900
736
1888)16400
15104
18966)129600
113796

0.09486. *Ans.*

12. Find the square root of 0.081.

0.08 10(0.28460
4
48)4 10
3 84
564)2600
2256
5686)34400
34116
28400

0.28460. *Ans.*

13. Find the square root of $\frac{64}{169}$.

$\sqrt{\frac{64}{169}} = \frac{\sqrt{64}}{\sqrt{169}} = \frac{8}{13}$. *Ans.*

14. Find the square root of $\frac{225}{361}$.

$\sqrt{\frac{225}{361}} = \frac{\sqrt{225}}{\sqrt{361}} = \frac{15}{19}$. *Ans.*

15. Find the square root of $\frac{3}{4}$.

$\frac{3}{4} = 0.75$.

0.75(0.86602
64
166)1100
996
1726)10400
10356
173202)440000
346404

0.86602. *Ans.*

16. Find the square root of ½.

½ = 0.5.

0.50(0.70710
49
1407)10000
9849
14141)15100
14141
141420)95900

0.70710. *Ans.*

17. A rectangle is 972 yds. long and 432 yds. wide. Find the side of a square which has the same area as the rectangle.

972 × 432 = 419904.

41 99 04(648
36
124)5 99
4 96
1288)1 03 04

648 yds. *Ans.*

18. Find in yards the length of the side of a square field containing 27 A. 12 sq. rds. 1 sq. yd.

27 A. 12 sq. rds. 1 sq. [yd.
160
4320
12
4332 sq. rds.
30¼
131044 sq. yds.

131044(362
9
66)410
396
722)1444
1444

362 yds. *Ans.*

19. Base = 39, perpendicular = 52; find hypotenuse.

$39^2 = 39 \times 39 = 1521$
$52^2 = 52 \times 52 = 2704$
4225(65
36
125)625
65. *Ans.* 625

20. Base = 35, hypotenuse = 91; find perpendicular.

$91^2 = 91 \times 91 = 8281$
$35^2 = 35 \times 35 = 1225$
7056(84
64
164)656
84. *Ans.* 656

21. Perpendicular = 72, hypotenuse = 75; find base.

$75^2 = 75 \times 75 = 5625$
$72^2 = 72 \times 72 = 5184$
441(21
4
41)41
21. *Ans.* 41

22. A cord 287 ft. long is stretched from the top of a flagpole 63 ft. high; find the distance of the end in contact with the ground from the base of the pole.

$287^2 = 82369$
$63^2 = 3969$
78400(280
4
48)384
384
560)00
280 ft. *Ans.*

23. Find the diagonal of a room 28 ft. long, 21 ft. wide, and 12 ft. high.

$$\begin{array}{rrl}
28^2 = & 784 & \\
21^2 = & 441 & \\
12^2 = & \underline{144} & \\
 & 1369 & (37 \\
 & \underline{9} & \\
67) & 469 & \\
 & \underline{469} &
\end{array}$$

37 ft. *Ans.*

24. Find the diagonal of a hall 50 ft. long, 30 ft. wide, and 15 ft. high.

$$\begin{array}{rrl}
50^2 = & 2500 & \\
30^2 = & 900 & \\
15^2 = & \underline{225} & \\
 & 3625 & (60.208 \\
 & \underline{36} & \\
1202) & 2500 & \\
 & \underline{2404} & \\
120408) & 960000 & \\
 & \underline{963264} &
\end{array}$$

60.208 ft. nearly. *Ans.*

Ex. 161. Page 275.

1. Find the cube root of 29791.

$$\begin{array}{rr|l}
 & & 29\,791\,(31 \\
 & & \underline{27} \\
3 \times 30^2 = & 2700 & 2\,791 \\
3 \times (30 \times 1) = & 90 & \\
1^2 = & \underline{1} & \\
 & 2791 & \underline{2\,791}
\end{array}$$

31. *Ans.*

2. Find the cube root of 357911.

$$\begin{array}{rr|l}
 & & 357\,911\,(71 \\
 & & \underline{343} \\
3 \times 70^2 = & 14700 & 14\,911 \\
3 \times (70 \times 1) = & 210 & \\
1^2 = & \underline{1} & \\
 & 14911 & \underline{14\,911}
\end{array}$$

71. *Ans.*

3. Find the cube root of 148877.

$$\begin{array}{rr|l}
 & & 148\,877\,(53 \\
 & & \underline{125} \\
3 \times 50^2 = & 7500 & 23\,877 \\
3 \times (50 \times 3) = & 450 & \\
3^2 = & \underline{9} & \\
 & 7959 & \underline{23\,877}
\end{array}$$

53. *Ans.*

4. Find the cube root of 103823.

$$
\begin{array}{rr|l}
 & & 103\,823\,(47 \\
 & & 64 \\ \cline{3-3}
3 \times 40^2 = & 4800 & 39\,823 \\
3 \times (40 \times 7) = & 840 & \\
7^2 = & \underline{49} & \\
 & 5689 & \underline{39\,823} \qquad 47.\ \textit{Ans.}
\end{array}
$$

5. Find the cube root of 53157376.

$$
\begin{array}{rr|l}
 & & 53\,157\,376\,(376 \\
 & & 27 \\ \cline{3-3}
3 \times 30^2 = & 2700 & 26\,157 \\
3 \times (30 \times 7) = & 630 & \\
7^2 = & \underline{49} & \\
 & 3379 & \underline{23\,653} \\
3 \times 370^2 = & 410700 & 2\,504\,376 \\
3 \times (370 \times 6) = & 6660 & \\
6^2 = & \underline{36} & \\
 & 417396 & \underline{2\,504\,376} \qquad 376.\ \textit{Ans.}
\end{array}
$$

6. Find the cube root of 62099136.

$$
\begin{array}{rr|l}
 & & 62\,099\,136\,(396 \\
 & & 27 \\ \cline{3-3}
3 \times 30^2 = & 2700 & 35\,099 \\
3 \times (30 \times 9) = & 810 & \\
9^2 = & \underline{81} & \\
 & 3591 & \underline{32\,319} \\
3 \times 390^2 = & 456300 & 2\,780\,136 \\
3 \times (390 \times 6) = & 7020 & \\
6^2 = & \underline{36} & \\
 & 463356 & \underline{2\,780\,136} \qquad 396.\ \textit{Ans.}
\end{array}
$$

7. Find the cube root of 41.421736.

$$
\begin{array}{rr|l}
 & & 41.421\,736\,(3.46 \\
 & & 27 \\ \cline{3-3}
3 \times 30^2 = & 2700 & 14\,421 \\
3 \times (30 \times 4) = & 360 & \\
4^2 = & \underline{16} & \\
 & 3076 & \underline{12\,304} \\
3 \times 340^2 = & 346800 & 2\,117\,736 \\
3 \times (340 \times 6) = & 6120 & \\
6^2 = & \underline{36} & \\
 & 352956 & \underline{2\,117\,736} \qquad 3.46.\ \textit{Ans.}
\end{array}
$$

8. Find the cube root of 12.812904.

	12.812 904(2.34	
	8	
$3 \times 20^2 = 1200$	4 812	
$3 \times (20 \times 3) = 180$		
$3^2 = 9$		
1389	4 167	
$3 \times 230^2 = 158700$	645 904	
$3 \times (230 \times 4) = 2760$		
$4^2 = 16$		
161476	645 904	2.34. *Ans.*

9. Find the cube root of 12396.8834.

	12 396.883 400(23.14388
	8
$3 \times 20^2 = 1200$	4 396
$3 \times (20 \times 3) = 180$	
$3^2 = 9$	
1389	4 167
189	229 883
$3 \times 230^2 = 158700$	
$3 \times (230 \times 1) = 690$	
$1^2 = 1$	
159391	159 391
691	70 492 400
$3 \times 2310^2 = 16008300$	
$3 \times (231 \times 4) = 27720$	
$4^2 = 16$	
16036036	64 144 144
27736	6 248 2560
$3 \times 2314^2 = 16063788$	4 819 1364
	1 429 11960
	1 285 10304
	1440 1656

23.14388. *Ans.*

10. Find the cube root of 0.00027.

	0.000 270(0.06463
	216
$3 \times 60^2 = 10800$	54000
$3 \times (60 \times 4) = 720$	
$4^2 = 16$	
11536	46144
736	7856000
$3 \times 640^2 = 1228800$	
$3 \times (640 \times 6) = 11520$	
$6^2 = 36$	
1240356	7442136
11556	4138640
$3 \times 6460^2 = 1251948$	3755834

0.06463. *Ans.*

12. Find the cube root of 277.2738.

	277.273 800(6.52083
	216
$3 \times 60^2 = 10800$	61 273
$3 \times (60 \times 5) = 900$	
$5^2 = 25$	
11725	58 625
925	2 648 800
$3 \times 650^2 = 1267500$	
$3 \times (650 \times 2) = 3900$	
$2^2 = 4$	
1271404	2 542 808
3904	105 992000000
$3 \times 65200^2 = 12753120000$	
$3 \times (65200 \times 8) = 1564800$	
$8^2 = 64$	
12754684864	102 037478912
1564864	39 545210880
12756249792	38 268749376

6.52083. *Ans.*

11. Find the cube root of 0.00008.

$$\begin{array}{rrl|l}
 & & & 0.000\,080\,(0.043088 \\
 & & & \underline{64} \\
3\times 40^2 = & 4800 & & 16000 \\
3\times(40\times 3) = & 360 & & \\
3^2 = & \underline{9} & & \\
 & 5169 & \Big\} & \underline{15507} \\
 & \underline{369} & & 493000000 \\
3\times 4300^2 = & 55470000 & & \\
3\times(4300\times 8) = & 103200 & & \\
8^2 = & \underline{64} & & \\
 & 55573264 & \Big\} & \underline{444586112} \\
 & \underline{103264} & & 484138880 \\
3\times 4308^2 = & 55676592 & & \underline{445412736}\quad 0.043088.\ \textit{Ans.}
\end{array}$$

13. Find the cube root of $\frac{64}{729}$.

$$\sqrt[3]{\frac{64}{729}} = \frac{\sqrt[3]{64}}{\sqrt[3]{729}} = \frac{4}{9}.\ \textit{Ans.}$$

14. Find the cube root of $\frac{125}{343}$.

$$\sqrt[3]{\frac{125}{343}} = \frac{\sqrt[3]{125}}{\sqrt[3]{343}} = \frac{5}{7}.\ \textit{Ans.}$$

15. Find the cube root of $\frac{16}{27}$.

$$\begin{array}{rrl|l}
 & & & 592\,592\,(0.839947 \\
\frac{16}{27} = & 0.592592 + & & \underline{512} \\
3\times 80^2 = & 19200 & & 80\,592 \\
3\times(80\times 3) = & 720 & & \\
3^2 = & \underline{9} & & \\
 & 19929 & \Big\} & \underline{59\,787} \\
 & \underline{729} & & 20\,805592 \\
3\times 830^2 = & 2066700 & & \\
3\times(830\times 9) = & 22410 & & \\
9^2 = & \underline{81} & & \\
 & 2089191 & \Big\} & \underline{18\,802719} \\
 & \underline{22491} & & 2\,002873592 \\
3\times 8390^2 = & 211176300 & & \\
3\times(8390\times 9) = & 226530 & & \\
9^2 = & \underline{81} & & \\
 & 211402911 & \Big\} & \underline{1\,902626199} \\
 & \underline{226611} & & 1002473930 \\
3\times 8399^2 = & 211629603 & & \underline{846518412} \\
 & & & 1559555180 \\
 & & & \underline{1481407221}\quad 0.839947.\ \textit{Ans.}
\end{array}$$

16. Find the cube root of $\frac{7}{8}$.

	0.875(0.95646 +
$\frac{7}{8} = 0.875$	729
$3 \times 90^2 = 24300$	146000
$3 \times (90 \times 5) = 1350$	
$5^2 = 25$	
25675	128375
1375	17625000
$3 \times 950^2 = 2707500$	
$3 \times (950 \times 6) = 17100$	
$6^2 = 36$	
2724636	16397816
17136	1277184000
$3 \times 9560^2 = 274180800$	
$3 \times (9560 \times 4) = 114720$	
$4^2 = 16$	
274295536	1097182144
114736	1800018560
$3 \times 9564^2 = 274410288$	1646461728
0.95646. *Ans.*	153556832

17. The liter contains 61.027 cu. in. Find the side of a cube containing a liter.

	61.027(3.9371 nearly.
	27
$3 \times 30^2 = 2700$	34 027
$3 \times (30 \times 9) = 810$	
$9^2 = 81$	
3591	32 319
891	1 708000
$3 \times 390^2 = 456300$	
$3 \times (390 \times 3) = 3510$	
$3^2 = 9$	
459819	1 379457
3519	328543000
$3 \times 3930^2 = 46334700$	
$3 \times (3930 \times 7) = 82530$	
$7^2 = 49$	
46417279	324920953
82579	36220470
$3 \times 3937^2 = 46499907$	3.9371 in. *Ans.*

18. The edges of a rectangular solid are 154 ft. 11 in., 70 ft. 7 in., 53 ft. 1 in. Find the edge of a cube equivalent to it.

154 ft. 11 in. = 1859 in. 53 ft. 1 in. = 637 in. 70 ft. 7 in. = 847 in.

$$1859 \times 637 \times 847 = 1\,003\,003\,001(1001$$

$$\begin{array}{rr|r}
 & & 1 \\ \hline
3 \times 1000^2 = & 3000000 & 3\,003\,001 \\
3 \times (1000 \times 1) = & 3000 & \\
1^2 = & \underline{1} & \\
 & 3003001 & \underline{3\,003\,001}
\end{array}$$

$$\begin{array}{r}
12\underline{)1001} \text{ in.} \\
83 \text{ ft. } 5 \text{ in. } \textit{Ans.}
\end{array}$$

Ex. 162. Page 277.

1. The volume of a rectangular solid is 1728 cu. in. The volume of a similar solid is 3375 cu. in. Find the ratio of two corresponding edges.

First edge : second edge = $\sqrt[3]{1728} : \sqrt[3]{3375} = 12 : 15 = 4 : 5$. *Ans.*

2. The surface of a solid is 600 sq. in. What is the surface of a similar solid whose edges are twice as great?

$1 : 2^2 = 600$: second surface. $1 : 4 = 600 : 2400$. 2400 sq. in. *Ans.*

3. If the volumes of two similar solids be 100 cu. in. and 1000 cu. in. respectively, find the ratio of their heights to the nearest thousandth of an inch.

First height : second height = $\sqrt[3]{100} : \sqrt[3]{1000} = 1 : \sqrt[3]{10} = 1 : 2.154$. *Ans.*

$$10(2.154$$

$$\begin{array}{rr|r}
 & & 8 \\ \hline
3 \times 20^2 = & 1200 & 2\,000 \\
3 \times 20 \times 1 = & 60 & \\
1^2 = & \underline{1} & \\
 & 1261 & \underline{1\,261} \\
 & \underline{61} & 739\,000 \\
3 \times 210^2 = & 132300 & \\
3 \times 210 \times 5 = & 3150 & \\
5^2 = & \underline{25} & \\
 & 135475 & \underline{677\,375} \\
 & \underline{3175} & 61\,625\,000 \\
3 \times 2150^2 = & 13867500 & \\
3 \times 2150 \times 4 = & 25800 & \\
4^2 = & \underline{16} & \\
 & 13893316 & \underline{55\,573\,264}
\end{array}$$

4. If two hills have the same shape, and one is 2700 ft. high, while the other is 3600 ft. high, find the ratio of their surfaces, and also the ratio of their volumes.

$$2700 : 3600 :: 27 : 36.$$
$$:: 3 : 4.$$

First surface : second surface $= 3^2 : 4^2 = 9 : 16$. *Ans.*

First volume : second volume $= 3^3 : 4^3 = 27 : 64$. *Ans.*

5. A bushel measure and a peck measure are of the same shape. Find the ratio of their heights.

1 bu. : 1 pk. $= \sqrt[3]{4} : \sqrt[3]{1} = 1.587 : 1 = 100 : 63$. *Ans.*

$$\begin{array}{rr|l}
 & & 4(1.587 \\
 & & 1 \\
3 \times 10^2 = & 300 & 3000 \\
3 \times (10 \times 5) = & 150 & \\
5^2 = & \underline{25} & \\
 & 475 & \underline{2375} \\
 & \underline{175} & 625000 \\
3 \times 150^2 = & 67500 & \\
3 \times (150 \times 8) = & 3600 & \\
8^2 = & \underline{64} & \\
 & 71164 & \underline{569312} \\
 & \underline{3664} & 556880 \\
 & 74892 &
\end{array}$$

6. The surfaces of two hills having the same shape are as 25 : 16. Find the ratio of their heights.

First surface : second surface $= 25 : 16$.

First height : second height $= \sqrt{25} : \sqrt{16} = 5 : 4$. *Ans.*

7. Of two similar solids, the volume of the larger is $1\frac{61}{64}$ of that of the smaller. Find the ratio of their heights; find also the ratio of their bases.

Larger volume : smaller volume $= 1\frac{61}{64} : 1 = \frac{125}{64} : 1$.

Larger height : smaller height $= \sqrt[3]{\frac{125}{64}} : 1 = \frac{5}{4} : 1 = 5 : 4$. *Ans.*

Larger base : smaller base $:: 5^2 : 4^2 = 25 : 16$. *Ans.*

8. The equatorial diameter of the earth is 7926 mi. Find that of Venus, whose volume is 0.953 of the volume of the earth.

Diameter E. : diameter V. $= \sqrt[3]{1} : \sqrt[3]{0.953} = 1 : 0.98408$.
Diameter of V. $=$ 0.98408 diameter of E. $= 0.98408 \times 7926$ mi.
$= 7799.8$ mi. *Ans.*

$$\begin{array}{rr|l}
\multicolumn{2}{r}{} & \multicolumn{1}{l}{0.953\,(0.98408} \\
\multicolumn{2}{r}{} & \multicolumn{1}{l}{729} \\
\cline{3-3}
3 \times 90^2 = & 24300 & 224000 \\
3 \times (90 \times 8) = & 2160 & \\
8^2 = & 64 & \\
\cline{2-2}
 & 26524 & 212192 \\
\cline{3-3}
 & 2224 & 11808000 \\
\cline{2-2}
3 \times 980^2 = & 2881200 & \\
3 \times (980 \times 4) = & 11760 & \\
4^2 = & 16 & \\
\cline{2-2}
 & 2892976 & 11571904 \\
\cline{3-3}
 & 11776 & 2360960000 \\
\cline{2-2}
3 \times 9840^2 = & 290476800 & 2323814400 \\
\cline{3-3}
\end{array}$$

Ex. 163. Page 279.

1. The floor of a room is a rectangle 15′6″ × 18′. Find its perimeter and its area.

2 × 15′ 6″ = 31′.
2 × 18′ = 36′.
31′ + 36′ = 67′, perimeter.
15′ 6″ × 18′ = 15½′ × 18′ = 279 sq. ft., area. *Ans.*

2. The ceiling of a room is a rectangle 16′ × 20′. Find its perimeter and its area.

2 × 16′ = 32′.
2 × 20′ = 40′.
40′ + 32′ = 72′, perimeter.
16′ × 20′ = 320 sq. ft., area. *Ans.*

3. A rectangular field is 60 rods × 80 rods. Find its area in acres, and the cost of fencing it at $1.50 a rod.

60 rds. × 80 rds. = 4800 sq. rds. = 4800 ÷ 160 = 30 A., area. *Ans.*
2 × 60 rds. + 2 × 80 rds. = 280 rds., perimeter.
280 × $1.50 = $420. *Ans.*

4. How many boards 12 ft. long will be required to inclose a square field 48 rds. on a side with a fence 4 boards high? How many acres are there in the field?

48 rds. = 48 × 16.5 = 792 ft.
792 ft. ÷ 12 = 66, number of lengths on a side.
4 × 66 = 264, whole number of lengths of fence.
4 × 264 = 1056, number of boards. *Ans.*
48 × 48 ÷ 160 = 14.4 A. *Ans.*

5. How many yards of carpeting $\frac{3}{4}$ of a yard wide will be required for a floor 20′ × 17′ 6″, if the strips run lengthwise, and if there is a waste of 9 in. a strip in matching the pattern?

17 ft. 6 in. = $17\frac{1}{2}$ ft.; $\frac{3}{4}$ yd. = $2\frac{1}{4}$ ft.

$$17\tfrac{1}{2} \div 2\tfrac{1}{4} = \frac{35}{\cancel{2}} \times \frac{\overset{2}{\cancel{4}}}{9} = \frac{70}{9} = 7\tfrac{7}{9}, \text{ or 8 strips necessary.}$$

20 ft. + 9 in. = $20\frac{3}{4}$ ft.
8 × $20\frac{3}{4}$ = 166 ft. = $55\frac{1}{3}$ yds. *Ans.*

6. How many yards of carpeting 1 yd. wide will be required for a room 18′ 4″ × 17′ 8″, if the strips run lengthwise of the room, and if there is a waste of 8 in. a strip in matching the pattern? Find the cost of carpeting the room if the carpet is worth 85 cts. a yard, and 10 cts. a yard is paid for making and laying.

$$17 \text{ ft. } 8 \text{ in.} = 17\tfrac{2}{3} \text{ ft.} = \frac{17\frac{2}{3}}{3} = 6 \text{ strips.}$$

18 ft. 4 in. + 8 in. = 19 ft. = $6\frac{1}{3}$ yds.
6 × $6\frac{1}{3}$ yds. = 38 yds. *Ans.*
85 cts. + 10 cts. = 95 cts., cost per yard.
38 × $0.95 = $36.10. *Ans.*

7. Find the cost of the carpet for a room 19′ 8″ × 17′ 10″, if the carpet is $\frac{3}{4}$ of a yard wide, and costs $1.75 a yard, the strips running across the room, and 9 in. a strip being wasted in matching the pattern.

19 ft. 8 in. = $19\frac{2}{3}$ ft.; $\frac{3}{4}$ yd. = $2\frac{1}{4}$ ft.
$19\frac{2}{3} \div 2\frac{1}{4} = \frac{4}{9} \times \frac{59}{3} = \frac{236}{27} = 9$ strips.
17 ft. 10 in. + 9 in. = $18\frac{7}{12}$ ft.
9 × $18\frac{7}{12}$ ft. = $167\frac{1}{4}$ ft. = 56 yds.
56 × $1.75 = $98. *Ans.*

8. Find the cost of plastering the walls and ceiling of a room $17'4'' \times 15'8'' \times 10'4''$, at 20 cts. per square yard, if 10 sq. yds. are deducted for doors, windows, and baseboard.

Perimeter of room $= 2 \times 17'4'' + 2 \times 15'8'' = 66'$.
Total area of walls $= 10\frac{1}{3} \times 66' = 682$ sq. ft.
Area of ceiling $= 17\frac{1}{3} \times 15\frac{2}{3} = \underline{271\frac{5}{9}\text{ sq. ft.}}$
Area of walls and ceiling $= 953\frac{5}{9}$ sq. ft.
10 sq. yds. to be deducted $= \underline{90\text{ sq. ft.}}$
Area allowed $= 863\frac{5}{9}$ sq. ft.
$\frac{863\frac{5}{9}}{9} = 96$ sq. yds. 96×20 cts. $= \$19.20$. *Ans.*

9. Find the cost of whitening the walls and ceiling of a room $16'6'' \times 15'6'' \times 9'6''$, at five cents per square yard, deducting 12 sq. yds. for doors, windows, and baseboard.

Perimeter of room $= 2 \times 16'6'' + 2 \times 15'6'' = 64'$.
Area of walls $= 9\frac{1}{2} \times 64 = 608$ sq. ft.
Area of ceiling $= 16\frac{1}{2} \times 15\frac{1}{2} = \underline{255\frac{3}{4}\text{ sq. ft.}}$
Area of walls and ceiling $= 863\frac{3}{4}$ sq. ft.
12 sq. yds. to be deducted $= \underline{108\text{ sq. ft.}}$
Area allowed $= 755\frac{3}{4}$ sq. ft.
$\frac{755\frac{3}{4}}{9} = 84$ sq. yds. 84×5 cts. $= \$4.20$. *Ans.*

10. Find the cost of plastering a room $18' \times 15' \times 10'$, at 30 cts. per square yard, if the room contains one door $7'6'' \times 4'$, three windows each $6' \times 4'$, and a baseboard one foot high around the room.

Perimeter of room $= 2 \times 18' + 2 \times 15' = 66'$.
Height of room above baseboard $= 10' - 1' = 9'$.
Total area of walls $= 9 \times 66 = 594$ sq. ft.
Area of ceiling $= 18 \times 15 = \underline{270\text{ sq. ft.}}$
Area of walls and ceiling $= 864$ sq. ft.
Height of door above baseboard $= 7'6'' - 1' = 6'6''$.
Area of door above baseboard $= 4 \times 6'6'' = 26$ sq. ft.
Area of 3 windows $= 3 \times 6' \times 4' = \underline{72\text{ sq. ft.}}$
Area of door and windows $= 98$ sq. ft.
Half area of door and windows $= 49$ sq. ft.
Area allowed is 864 sq. ft. $-$ 49 sq. ft. $=$ 815 sq. ft.
$\frac{815}{9} = 91$ sq. yds. 91×30 cts. $= \$27.30$. *Ans.*

11. How many double rolls of paper will be required for a room of ordinary height, $18'\,4'' \times 16'\,6''$, with two doors and three windows, each 4 ft. wide?

$$
\begin{aligned}
&\text{Perimeter of room} = 2 \times 18\tfrac{1}{3}' + 2 \times 16\tfrac{1}{2}' = 69\tfrac{2}{3}'.\\
&\text{Width of doors and windows} = 5 \times 4' \quad = \underline{20'}.\\
&\text{Deducting width of doors and windows} \quad = 49\tfrac{2}{3}'.\\
&\frac{49\frac{2}{3}}{7} = 7. \text{ *Ans.*}
\end{aligned}
$$

12. Find the cost of paper at 25 cts. a single roll, and bordering at 8 cts. a yard, for a room of ordinary height, $17'\,9'' \times 17'\,3''$, allowing for one door and four windows, each $4'\,2''$. (No allowance for doors and windows is made for the bordering.)

$$
\begin{aligned}
&\text{Perimeter of room} = 2 \times 17\tfrac{3}{4}' + 2 \times 17\tfrac{1}{4}' = 70'.\\
&\text{Width of doors and windows} = 5 \times 4\tfrac{1}{6}' \quad = \underline{20\tfrac{5}{6}'}.\\
&\text{Deducting width of doors and windows} \quad = 49\tfrac{1}{6}'.\\
&\frac{49\frac{1}{6}}{7} = 7. \qquad 2 \times 7 = 14 \text{ single rolls.} \qquad 70 \text{ ft.} = 24 \text{ yds.}\\
&14 \times 25 \text{ cts.} = \$3.50\\
&24 \times \ \ 8 \text{ cts.} = \ \ \underline{1.92}\\
&\qquad\qquad\qquad \$5.42. \text{ *Ans.*}
\end{aligned}
$$

13. Find the cost of paper at 50 cts. a single roll for a room of ordinary height, $20'\,8'' \times 17'\,6''$, with two doors and three windows, each $4'\,2''$ wide.

$$
\begin{aligned}
&\text{Perimeter of room} = 2 \times 20\tfrac{2}{3}' + 2 \times 17\tfrac{1}{2}' = 76\tfrac{1}{3}'.\\
&\text{Width of doors and windows } 5 \times 4\tfrac{1}{6}' \quad = \underline{20\tfrac{5}{6}'}.\\
&\text{Deducting width of doors and windows} \quad = 55\tfrac{1}{2}'.\\
&\frac{55\frac{1}{2}}{7} = 8. \qquad 2 \times 8 = 16 \text{ single rolls.}\\
&16 \times 50 \text{ cents} = \$8.00. \text{ *Ans.*}
\end{aligned}
$$

14. How many bundles of laths will be required for the ceiling and walls of a room 26 ft. square, 14 ft. high, allowing 20 sq. yds. for doors, windows, and baseboard?

26 ft. $= 8\frac{2}{3}$ yds.; 14 ft. $= 4\frac{2}{3}$ yds.
Perimeter of room $= 4 \times 8\frac{2}{3}$ yds. $= 34\frac{2}{3}$ yds.
Area of walls $= 4\frac{2}{3} \times 34\frac{2}{3} = 161\frac{7}{9}$ sq. yds.
Area of ceiling $= 8\frac{2}{3} \times 8\frac{2}{3} = 75\frac{1}{9}$ sq. yds.
Area of walls and ceiling $= 236\frac{8}{9}$ sq. yds.
Amount to be deducted $= 20$ sq. yds.
$216\frac{8}{9}$ sq. yds.

$\frac{216\frac{8}{9}}{5} = 44.$ 44 bundles. *Ans.*

15. How many bundles of laths are required for the ceiling and walls of a room 28′ × 32′ and 16′ high, allowing for three windows 8′ × 3′6″ each, and two doors 8′ × 4′2″ each, and a baseboard 1 ft. high?

Perimeter of room $= 2 \times 28' + 2 \times 32' = 120'$.
Height of room above baseboard $= 16' - 1' = 15'$.
Area of walls $= 15' \times 120' = 1800$ sq. ft.
Area of ceiling $= 28' \times 32' = 896$ sq. ft.
Area of walls and ceiling $= 2696$ sq. ft.
Height of doors above baseboard $= 8' - 1' = 7'$.
Area of 2 doors $= 2 \times 7' \times 4\frac{1}{6}' = 58\frac{1}{3}$ sq. ft.
Area of 3 windows $= 3 \times 8' \times 3\frac{1}{2}' = 84$ sq. ft.
Area of doors and windows $= 142\frac{1}{3}$ sq. ft.
Area allowed $= 2696$ sq. ft. $- 142\frac{1}{3}$ sq. ft. $= 2553\frac{2}{3}$ sq. ft.
$= 284$ sq. yds.

$\frac{284}{5} = 57.$ 57 bundles. *Ans.*

16. How many clapboards will be required for the front of a house 40 ft. long and 20 ft. high, allowing 96 sq. ft. for doors and windows, and adding 10% for waste?

$3\frac{1}{2}$ in. $= \frac{3\frac{1}{2}}{12}$ ft. $= \frac{7}{24}$ ft.
$4 \times \frac{7}{24} = \frac{28}{24} = 1\frac{1}{6}$ sq. ft. for each clapboard.
$40 \times 20 = 800$ sq. ft.; 800 sq. ft. $- 96$ sq. ft. $= 704$ sq. ft.
$\frac{704}{1\frac{1}{6}} = \frac{6}{7}$ of $704 = 604$.
10% of $604 = 60$; $604 + 60 = 664$. *Ans.*

17. Allowing 1000 shingles for 120 sq. ft., how many thousand would be required to cover the pitched roof of a house 44 ft. long, if the width of each side of the roof is 24 ft.?

2 × 44′ × 24′ = 2112 sq. ft. in roof.
$\frac{2112}{120}$ = 17.6. 17.6 M. *Ans.*

18. Allowing 1000 shingles for 110 sq. ft., how many thousand would be required to cover the pitched roof of a building 54 ft. long, if the width of each side of the roof is 28 ft.?

2 × 54′ × 28′ = 3024 sq. ft.
$\frac{3024}{110}$ = 27.49. 27.5 M. *Ans.*

19. How many slates at 3 to the square foot will be required to cover 28 squares of roof?

28 squares = 2800 sq. ft.
2800 × 3 = 8400 slates. *Ans.*

20. The floor of a gymnasium is 100′ × 60′. Find the cost of birch for the floor at $40 a thousand, adding 20% for waste.

100′ × 60′ = 6000 sq. ft.
6000 + 20% of 6000 = 6000 + 1200 = 7200.
7.2 × $40 = $288. *Ans.*

21. Find the area of a triangle, having given base 30′ 6″, altitude 12′ 6″.

30½′ × 12½′ = 381.25 sq. ft.
½ of 381.25 = 190.625 sq. ft. *Ans.*

22. Find the area of a triangle, having given base 148 rds., altitude 60 rds.

148 rds. × 60 rds. = 8880 sq. rds.
½ of 8880 sq. rds. = 4440 sq. rds. = $\frac{4440}{160}$ A.
= 27 A. 120 sq. rds. *Ans.*

23. Find the area of a triangle, having given base 10 chains 40 links, altitude 8 chains 50 links.

10.4 chains × 8.5 chains = 88.4 sq. ch.
½ of 88.4 sq. ch. = 44.2 sq. ch. *Ans.*

24. Find the area of a triangle, having given sides 60 ft. 80 ft. 90 ft.

$\frac{1}{2}(60+80+90)=115.$

$115-60=55;\ 115-80=35;\ 115-90=25.$

$\sqrt{115\times55\times35\times25}=2352.5$ sq. ft. *Ans.*

25. Find the area of a triangle, having sides 100 ft., 110 ft., 120 ft.

$\frac{1}{2}(100+110+120)=165.$

$165-100=65;\ 165-110=55;\ 165-120=45.$

$\sqrt{165\times65\times55\times45}=5152.12$ sq. ft. *Ans.*

26. Find the area of a circle, having given radius 14 ft.

$14^2=196.$

$$\begin{array}{r}3.1416\\ \underline{196}\\ 188496\\ 282744\\ \underline{31416}\\ 615.7536\end{array}$$
sq. ft. *Ans.*

27. Find the area of a circle, having given radius 7 yds.

$7^2=49.$

$$\begin{array}{r}3.1416\\ \underline{49}\\ 282744\\ \underline{125664}\\ 153.9384\end{array}$$
sq. yds. *Ans.*

28. Find the area of a circle, having given diameter 32 yds.

$\frac{1}{2}$ of $32=16.\quad 16^2=256.$

$$\begin{array}{r}3.1416\\ \underline{256}\\ 188496\\ 157080\\ \underline{62832}\\ 804.2496\end{array}$$
sq. yds. *Ans.*

29. Find the area of a circle, having given diameter 40 ft.

$\frac{1}{2}$ of $40=20.$

$20^2=400.$

$$\begin{array}{r}3.1416\\ \underline{400}\\ 1256.6400\end{array}$$
sq. ft. *Ans.*

30. Find the area of a circle, having given diameter 100 rds.

$\frac{1}{2}$ of $100=50.$

$50^2=2500.$

$$\begin{array}{r}3.1416\\ \underline{2500}\\ 15708000\\ \underline{6283200}\\ 7854.0000\end{array}$$
sq. rds.

7854 sq. rds. $=\frac{7854}{160}$ A.

$=49$ A. 14 sq. rds. *Ans.*

31. Find the volume of a cube whose edge is 3 in.

$3\times3\times3=27$ cu. in. *Ans.*

32. Find the volume of a cube whose edge is 14 in.

$$14 \times 14 \times 14 = 2744 \text{ cu. in. } \textit{Ans.}$$

33. Find the volume of a cube whose edge is 2 ft.

$$2 \times 2 \times 2 = 8 \text{ cu. ft. } \textit{Ans.}$$

34. Find the volume of a rectangular solid $10'' \times 8'' \times 6''$.

$$10'' \times 8'' \times 6'' = 480 \text{ cu. in. } \textit{Ans.}$$

35. Find the volume of a rectangular solid $6' \times 5' \times 4'$.

$$6' \times 5' \times 4' = 120 \text{ cu. ft. } \textit{Ans.}$$

36. Find the volume of a rectangular solid $4'\,8'' \times 3'\,10'' \times 3'\,6''$.

$$4\tfrac{2}{3}' \times 3\tfrac{5}{6}' \times 3\tfrac{1}{2}' = \frac{\overset{7}{\cancel{14}}}{3} \times \frac{23}{6} \times \frac{7}{\cancel{2}} = \frac{1127}{18} = 62\tfrac{11}{18} \text{ cu. ft.}$$

$$= 62 \text{ cu. ft. } 1056 \text{ cu. in. } \textit{Ans.}$$

37. If a cellar which measures $32' \times 28'$ is flooded to a depth of 4 in., what is the weight of the water, allowing 1 cu. ft. of water to weigh 1000 oz.?

$32 \times 28 \times \frac{1}{3} = 298\frac{2}{3}$ cu. ft.
$298\frac{2}{3} \times 1000$ oz. $= 298666\frac{2}{3}$ oz.
16)$\underline{298666\frac{2}{3}}$ oz.
2000)$\underline{18666}$ lbs. $10\frac{2}{3}$ oz.
9 t. 666 lbs.

9 t. 666 lbs. $10\frac{2}{3}$ oz. *Ans.*

38. How many gallons of water will a cistern hold that is $5\frac{1}{2}$ ft. long, $3\frac{3}{4}$ ft. wide, and 4 ft. deep?

$$5\tfrac{1}{2} \times 3\tfrac{3}{4} \times 4 = \frac{11}{2} \times \frac{15}{\cancel{4}} \times \frac{\cancel{4}}{1} = \frac{165}{2} = 82.5$$

$$\begin{array}{rr} & 7.5 \\ \hline & 618.75 \\ \frac{1}{2} \text{ of } 1\% = & 3.09 \\ \hline & 615.66 \text{ gals. } \textit{Ans.} \end{array}$$

39. How many barrels of water will a cistern hold that is 13 ft. long, 8 ft. wide, and 7 ft. deep?

$$13 \times 8 \times 7 = 728 \text{ cu. ft.} \qquad \frac{728}{4.21} = 172.9 \text{ barrels. } \textit{Ans.}$$

40. How many barrels of water will a cistern hold that is 12 ft. long, 9 ft. wide, and 6 ft. deep?

$$12 \times 9 \times 6 = 648 \text{ cu. ft.} \qquad \frac{648}{4.21} = 153.9 \text{ barrels. } \textit{Ans.}$$

41. Find the number of gallons that a round cistern will hold, 8 ft. in diameter and 7 ft. deep.

$$\begin{array}{rrl} \text{Area of base} = 3.1416 \times 4 \times 4 = & 50.2656 & \text{sq. ft.} \\ & \underline{7} & \\ & 351.8592 & \text{cu. ft.} \\ & \underline{7.5} & \\ & 2638.944 & \\ \tfrac{1}{2} \text{ of } 1\% = & \underline{13.195} & \\ & 2625.749 & \text{gals. } \textit{Ans.} \end{array}$$

42. Find the number of barrels in a round cistern 21 ft. in diameter and 10 ft. deep.

$$\begin{array}{rrl} \text{Area of base} = 3.1416 \times 10.5 \times 10.5 = & 346.3614 & \text{sq. ft.} \\ & \underline{10} & \\ & 3463.6140 & \text{cu. ft.} \\ 4.21) & \underline{3463.614} & \\ & 823 & \textbf{nearly.} \end{array}$$

43. Find the number of bushels in a bin 20 ft. long, 6 ft. wide, and 4 ft. high.

$$\begin{array}{rrl} 20 \times 6 \times 4 = & 480. & \\ & \underline{0.8} & \\ & 384.0 & \\ \tfrac{1}{2} \text{ of } 1\% = & \underline{1.92} & \\ & 385.92 & \text{bu. } \textit{Ans.} \end{array}$$

44. Find the number of bushels in a bin 8½ ft. long, 5½ ft. wide, and 4 ft. high.

$$\begin{array}{rrl} 8\tfrac{1}{2} \times 5\tfrac{1}{2} \times 4 = & 187. & \\ & \underline{0.8} & \\ & 149.6 & \\ \tfrac{1}{2} \text{ of } 1\% = & \underline{0.75} & \\ & 150.35 & \text{bu. } \textit{Ans.} \end{array}$$

45. Find the number of bushels in a bin 8 ft. long, 6¾ ft. wide, and 4½ ft. high.

$$\begin{array}{rl} 8\times 6\tfrac{3}{4}\times 4\tfrac{1}{2} = & 243.\\ & \underline{0.8}\\ & 194.4\\ \tfrac{1}{2}\text{ of }1\% = & \underline{0.97}\\ & 195.37\text{ bu. } \textit{Ans.}\end{array}$$

46. How many cubic feet in a bin that will hold 400 bu.?

$$\begin{array}{rl} 4) & 400\\ & \underline{100}\\ & 500\\ \tfrac{1}{2}\text{ of }1\% = & \underline{2.5}\\ & 497.5\text{ cu. ft. } \textit{Ans.}\end{array}$$

47. How many cubic feet in a bin that will hold 372 bu.?

$$\begin{array}{rl} 4) & 372\\ & \underline{93}\\ & 465\\ \tfrac{1}{2}\text{ of }1\% = & \underline{2.33}\\ & 462.67\text{ cu. ft. } \textit{Ans.}\end{array}$$

48. How many cubic feet in a bin that will hold 1326 bu.?

$$\begin{array}{rl} 4) & 1326\\ & \underline{331.5}\\ & 1657.5\\ \tfrac{1}{2}\text{ of }1\% = & \underline{8.28}\\ & 1649.22\text{ cu. ft. } \textit{Ans.}\end{array}$$

49. How many bushels of charcoal in a load 8 ft. long, 4 ft. wide, and 6 ft. high?

$$\begin{array}{rl} 8\times 4\times 6 = & 192.\\ & \underline{0.8}\\ & 153.6\\ \tfrac{1}{2}\text{ of }1\% = & \underline{0.77}\\ & 154.37\text{ bu. } \textit{Ans.}\end{array}$$

50. Find the number of bushels in a load of charcoal that is 8 ft. long, 4½ ft. wide, and 6 ft. high.

$$\begin{array}{rl} 8\times 4\tfrac{1}{2}\times 6 = & 216.\\ & \underline{0.8}\\ & 172.8\\ \tfrac{1}{2}\text{ of }1\% = & \underline{0.86}\\ & 173.66\text{ bu. } \textit{Ans.}\end{array}$$

51. What part of a cord does a load of wood contain which is 8 ft. long. 4 ft. wide, 3½ ft. high?

$$\frac{\cancel{8}\times\cancel{4}\times 3\tfrac{1}{2}}{\cancel{8}\times\cancel{4}\times 4} = \frac{7}{8}\text{ cord. } \textit{Ans.}$$

52. What part of a cord does a load of wood contain which is 8 ft. long, 3 ft. 8 in. high, if the average length of the sticks is 3 ft. 8 in.?

$$3\text{ ft. }8\text{ in.} = \tfrac{11}{3}\text{ ft.}$$

$$\frac{\cancel{8}\times\frac{11}{3}\times\frac{11}{3}}{\cancel{8}\times 4\times 4} = \frac{\frac{121}{9}}{16} = \frac{121}{144}\text{ cord. } \textit{Ans.}$$

53. Find the number of cords in a pile of wood 120 ft. long, 4 ft. wide, and 6 ft. high.

$$\frac{\overset{15}{\cancel{120}}\times\cancel{4}\times\overset{3}{\cancel{6}}}{\cancel{8}\times\cancel{4}\times\underset{2}{\cancel{4}}} = \frac{45}{2} = 22\tfrac{1}{2}\text{ cords. } \textit{Ans.}$$

54. How much should be paid for a pile of 4-foot wood, 100 ft. long, and averaging 5 ft. high, at $5 a cord?

$$\frac{\overset{25}{\cancel{100}}\times\cancel{4}\times 5}{\underset{2}{\cancel{8}}\times\cancel{4}\times 4} = \frac{125}{8} = 15\tfrac{5}{8}\text{ cords.}$$

$$15\tfrac{5}{8}\times \$5 = \$78.125.\ \textit{Ans.}$$

55. How many short tons of hard coal will a rectangular bin hold, 9 ft. long, 6 ft. 6 in. wide, and 6 ft. high?

$9 \times 6\frac{1}{2} \times 6 = 351$ cu. ft.
$\frac{351}{37} = 9\frac{18}{37}$ tons.
$9\frac{1}{2}$ tons. *Ans.*

56. How many short tons of hard coal can be put into a rectangular bin 8 ft. long, 7 ft. wide, and 6 ft. high?

$8 \times 7 \times 6 = 336$ cu. ft.
$\frac{336}{37} = 9\frac{3}{37}$ tons. 9 tons. *Ans.*

57. How many long tons of soft coal can be put into a rectangular bin 12 ft. long, 9 ft. wide, and 7 ft. high?

$12 \times 9 \times 7 = 756.$
$\frac{756}{48} = 15\frac{3}{4}$ tons. *Ans.*

58. How many loads are there in a rectangular embankment 200 ft. long, 15 ft. wide, and 10 ft. high?

$200 \times 15 \times 10 = 30{,}000$ cu. ft. $= 1111\frac{1}{9}$ cu. yds. or loads. *Ans.*

59. How many loads in an embankment 150 ft. long, 20 ft. wide, and 5 ft. high?

$150 \times 20 \times 5 = 15{,}000$ cu. ft. $= 555\frac{5}{9}$ cu. yds. or loads. *Ans.*

60. How many bricks will be required to build a wall 84 ft. long, 32 ft. high, and 1 ft. thick?

$84 \times 32 \times 1 = 2688$ cu. ft. $2688 \times 22 = 59136.$ 59,136. *Ans.*

61. How many bricks will be required for the walls of a house 42 ft. long, 32 ft. wide, and 21 ft. high, if the walls are 1 ft. thick, and there are deducted 2 doors $7' 6'' \times 4'$ each, and 16 windows $5' \times 4'$ each?

Area of sides $= 2 \times 42 \times 21 = 1764$ sq. ft.
Area of ends $= 2 \times 32 \times 21 = 1344$ sq. ft.

Total area $= 3108$ sq. ft.

Area of 2 doors $= 2 \times 7' 6'' \times 4' = 60$ sq. ft.
Area of windows $= 16 \times 5' \times 4' = 320$ sq. ft.

Area of doors and windows $= 380$ sq. ft.
Total area of walls $= 2728$ sq. ft.
$1 \times 2728 = 2728$ cu. ft.
$2728 \times 22 = 60016.$ 60,016. *Ans.*

62. How many cubic feet of stone masonry in the foundation of a house 40′ × 30′, if the foundation is to be 4 ft. high and 2 ft. thick?

Number of cubic feet in sides $= 2 \times 40 \times 4 \times 2 = 640$
Number of cubic feet in ends $= 2 \times 30 \times 4 \times 2 = \underline{480}$
Number of cubic feet in sides and ends $= 1120$
1120 cu. ft. *Ans.*

63. How many perches of stone are required for the foundation of a building 100′ × 60′, if the foundation is 6 ft. high, and 2½ ft. thick?

Number of cubic feet in sides $= 2 \times 100 \times 6 \times 2\frac{1}{2} = 3000$
Number of cubic feet in ends $= 2 \times 60 \times 6 \times 2\frac{1}{2} = \underline{1800}$
Number of cubic feet in sides and ends $= 4800$
4800 cu. ft. $= \frac{4800}{25} = 192$ perches. *Ans.*

64. How many feet board measure in 8 planks, 4 in. thick, 18 ft. long and 16 in. wide?

$$8 \times \cancel{4} \times \overset{6}{\cancel{18}} \times \frac{16}{\underset{\cancel{4}}{\cancel{12}}} = 768. \qquad 768 \text{ ft. } \textit{Ans.}$$

65. How many feet board measure in a stick of timber 1 ft. square and 20 ft. long?

$$12 \times \frac{\cancel{12}}{\cancel{12}} \times 20 = 240. \qquad 240 \text{ ft. } \textit{Ans.}$$

66. How many feet board measure in 40 joists 10″ × 2″ and 12 ft. long?

$$40 \times 2 \times \frac{10}{\cancel{12}} \times \cancel{12} = 800. \qquad 800 \text{ ft. } \textit{Ans.}$$

67. Find the number of feet board measure in a log 12 ft. long and 16 in. in diameter.

$$16^2 - 2 \times 16 = 256 - 32 = 224. \qquad \frac{21}{\underset{5}{\cancel{40}}} \text{ of } \overset{28}{\cancel{224}} = \frac{588}{5}$$

$$\frac{12}{\underset{5}{\cancel{10}}} \text{ of } \frac{\overset{294}{\cancel{588}}}{5} = \frac{3528}{25} = 141\tfrac{3}{25}. \qquad 141 \text{ ft. } \textit{Ans.}$$

68. Find the number of feet board measure in a log 13 ft. long and 12 in. in diameter.

$$12^2 - 2 \times 12 = 144 - 24 = 120. \qquad \frac{21}{\cancel{40}} \text{ of } \frac{\overset{3}{\cancel{120}}}{1} = 63.$$

$$\tfrac{13}{10} \text{ of } 63 = 81.9. \qquad 82 \text{ ft. } \textit{Ans.}$$

69. Find the number of feet board measure in a log 14 ft. long and 20 in. in diameter.

$$20^2 - 2 \times 20 = 400 - 40 = 360. \qquad \frac{21}{\cancel{40}} \text{ of } \frac{\overset{9}{\cancel{360}}}{1} = 189.$$

$$\tfrac{14}{10} \text{ of } 189 = 264.6 \qquad 265 \text{ ft. } \textit{Ans.}$$

70. Find the number of feet board measure in a log 15 ft. long and 15 in. in diameter.

$$15^2 - 2 \times 15 = 225 - 30 = 195. \qquad \tfrac{21}{40} \text{ of } 195 = \tfrac{819}{8}.$$

$$\frac{\overset{3}{\cancel{15}}}{\underset{2}{\cancel{10}}} \text{ of } \frac{819}{8} = \frac{2457}{16} = 153\tfrac{9}{16}. \qquad 154 \text{ ft. } \textit{Ans.}$$

71. Find the number of gallons contained in a cask of which the bung diameter is 24 in., head diameter 20 in., and the length 36 in.

$$\begin{array}{r}
24\\
\underline{20}\\
4\\
\underline{0.65}\\
\underline{2.60}\\
\underline{20.}\\
22.60\\
\underline{22.6}\\
510.76\\
\underline{36}\\
294\overline{)18387.36}\\
62.54 \text{ gals. } \textit{Ans.}
\end{array}$$

72. Find the number of gallons contained in a cask of which the bung diameter is 30 in., head diameter 26 in., and the length 38 in.

$$\begin{array}{r}
30\\
\underline{26}\\
4\\
\underline{0.65}\\
\underline{2.60}\\
\underline{26.}\\
28.60\\
\underline{28.6}\\
817.96\\
\underline{38}\\
294\overline{)31082.48}\\
105.72 \text{ gals. } \textit{Ans.}
\end{array}$$

73. How many square inches on the surface of a ball, 4 in. in diameter?

$4^2 = 16.$

3.1416
16
188496
31416
50.2656 sq. in. *Ans.*

74. How many square inches on the surface of a globe, 18 in. in diameter?

$18^2 = 324.$

3.1416
324
125664
62832
94248
1017.8784 sq. in. *Ans.*

75. Find the volume of a globe 2 ft. in diameter.

$2^3 = 8.$

$8 \times 0.5236 = 4.1888$ cu. ft. *Ans.*

Ex. 164. Page 293.

1. Fifteen men and eight boys together earn \$342 a week. If a boy's pay is half a man's pay, what are the daily wages of a man, and also of a boy?

The pay for 8 boys = pay for 4 men.
$15 + 4 = 19.$ $\$342 \div 19 = \$18.$
$\$18 \div 6 = \$3$, pay for 1 man. *Ans.*
$\$3 \div 2 = \$1.50$, pay for 1 boy. *Ans.*

2. A man divides \$1622.50 among four persons so that the first has \$40 more than the second, the second \$60 more than the third, and the third \$87.50 more than the fourth. Find the part of the fourth.

The third has the same share as the fourth + \$ 87.50
The second has the same share as the fourth + 147.50
The first has the same share as the fourth + 187.50
Therefore the fourth has ¼ of \$1622.50 − \$422.50
$\$1622.50 - \$422.50 = \$1200.$ ¼ of $\$1200 = \$300.$ *Ans.*

3. A family of six persons makes \$8.75 a day, and works 304 days in the year. At the end of the year each member of the family puts \$80 in a savings bank. Find the daily expense of the family.

\$8.75
304
3500
2625
\$2660.00
6 × \$80 = 480.00
\$2180.00

365)\$2180(5.97
1825
3550
3285
2650
2555
100

\$5.97. *Ans.*

4. A man bought 5.5 yards of cloth for $35. In having a suit made from it, he found that he lacked 1.75 yards, which he purchased at the price per yard of his first purchase. What is the cost of the suit if the trimmings cost $6.50 and the making $15?

5.5)$35.00
$6.36
5.5 + 1.75 = 7.25
$46.13
6.50
15.00
$67.63. *Ans.*

5. A man has 76.25 yards of linen, worth 44 cents a yard, made into shirts. It takes 3.05 yards for a shirt, and the price for making is 50 cents a shirt. Find the cost of a shirt, and the number he has made.

3.05)76.25
25
3.05 × $0.44 = $1.342
0.50
$1.842
25 at $1.842. *Ans.*

6. A man's expenses from the first of January to the end of October 17 are $1845.50. How much must he diminish his daily expense in order that the total expense for the year shall not exceed $2200?

Jan. 1 to Oct. 17 = 290 days.
Oct. 17 to Jan. 1 = 75 days.

$2200.
1845.50
75)354.50
4.72
290)$1845.50
6.36
4.72
$1.64. *Ans.*

7. A quart contains 1600 beans of average size, and a field is planted with 22 rows of 800 hills each, with 6 beans in a hill. The increase is tenfold. What is the value of the crop at $3 a bushel? (There are 32 quarts in a bushel.)

800
22
17600
6
105600
10
1600)1056000 beans.
32)660 qts.
20.625 bu.
3
61.875
$61.875. *Ans.*

8. For making 25 gallons of ordinary beer 60 pounds of barley and 0.5 of a pound of hops are needed. If the barley costs $1.50 for 60 pounds, and the hops cost 18 cents a pound, what is the profit to the brewer on a cask of 42 gallons if he sells it for $5 and reckons his labor $1.50?

```
                      $1.50
0.5 of 18 cts. =       0.09
                  25)$1.59
                     $0.0636 cost of 1 gal.
                          42
                     $2.6712 cost of 42 gals.
                       1.50
                     $4.17 cost with labor.

                       $5.00
                        4.17
                       $0.33  Ans.
```

9. A person receives his income quarterly. The first quarter he receives $533.25, the second $1535.20, the third $356.44, the fourth $725.19. His expenses for these quarters are respectively $686.60, $734.25, $589.15, $849.65. How much does he save for the year?

```
$ 533.25        $686.60
 1535.20         734.25
  356.44         589.15
  725.19         849.65
$3650.08       $2859.65
 2859.65
 $790.43  Ans.
```

10. A hen lays on an average 120 eggs a year worth 24 cents a dozen. She eats a quart of barley every 5 days. The barley is worth 56 cents a bushel (32 quarts). What is the annual profit from this hen?

```
12)120              5 | 365
   10 doz.         32 |  73 qts.
 $0.24                  2.28 bu.
 $2.40                $0.56
  1.28               $1.276
  1.12      $1.12  Ans.
```

11. A square garden measuring on each side 40.50 yards is enclosed by three lines of galvanized iron wire. Eight yards of this wire weigh a pound, and it is worth 7.5 cents per pound. What is the cost of the wire?

Perimeter of garden $= 4 \times 40.50 = 162$ yards.

Three lines $= 3 \times 162$ yards.

$$\text{Weight in pounds} = \frac{3 \times 162}{8}.$$

$$\text{Cost} = \$\frac{3 \times 162 \times 0.075}{8} = \$4.56. \textit{ Ans.}$$

12. A family composed of five persons consumes daily one pound of stale bread for each person, or 1.15 pounds of fresh bread. If bread is worth 5 cents a pound, find the annual saving which this family will make if it eats stale bread altogether.

```
 1.15
 1
 0.15 lb. saved daily by eating stale bread.
  365
54.75 lbs. saved for the year.
```

54.75
0.05
2.7375 dollars saved by each person.
5
13.6875 $13.69. *Ans.*

13. It is estimated that in France 240,000 women and girls are employed in making lace. The annual production has a value of $13,000,000, and the value of the raw material is 0.27 of the value of the lace. Find the average daily wages of these women and girls, supposing that each works 240 days in the year.

Wages = 1. − 0.27 = 0.73 of value of the lace.

$13000000
0.73
$9,490,000 = total amount of wages.

240
240000
57,600,000 = number of days' work.

57600000)$9490000.00
$0.165 16½ cents. *Ans.*

14. The salt water which is obtained from the bottom of a mine of rock salt contains 0.09 of its weight of pure salt. What weight of salt water is it necessary to evaporate in order to obtain 4734 pounds of salt?

0.09)4734.00
52600 lbs. *Ans.*

15. The weight of ashes from the burning of oak wood is 0.03 of the weight of the wood, and the weight of carbonate of potash contained in the ashes is 0.065 of the weight of the ashes. Find the weight of carbonate of potash from 1170 pounds of wood.

1170
0.03
35.10
0.065
2.2815 lbs. *Ans.*

16. The weight of sugar from the sugar beet is nearly 0.06 of the weight of the beet. If an acre produces 30,000 pounds of beets that are sold at the rate of \$2 a thousand pounds, how many acres of land is it necessary to sow to furnish beets to a sugar factory which produces 150,000 pounds a year, and what will be the value of the crop obtained?

$$\begin{array}{r|l} 0.06 & \underline{150000} \\ 30000 & \underline{2500000}\text{ lbs.} \\ & \quad 83.333\text{ A. } \textit{Ans.} \end{array}$$

$$2500.000 \times \$2 = \$5000.\ \textit{Ans.}$$

17. If a workman has taken every day for the last 12 years two glasses of beer at 5 cents a glass, how much could he have saved if he had not indulged this habit, reckoning 365 days each year?

$$\begin{array}{r} 365 \\ \underline{12} \\ 4380 \\ 2 \times 0.05 = \underline{0.10} \\ 438.00 \end{array} \qquad \$438.\ \textit{Ans.}$$

18. A woman has three children. She pays for each \$15 a year for having their clothes made, \$1.50 a month for mending, and \$0.35 a week for washing. How much could she save in a year if she knew how to wash, make clothes, and mend?

$$\begin{array}{r} 3 \times \$15 = \$45. \\ 3 \times 12 \times \$1.50 = \ \ 54. \\ 3 \times 52 \times \$0.35 = \underline{\ \ 54.60} \\ \$153.60.\ \textit{Ans.} \end{array}$$

19. A sheep raiser shears his sheep at an expense of 11 cents a head. The sheep average 8 pounds of wool which he sells for 23 cents a pound. He finds that his net profit after paying for the shearing is \$1297.50. How many sheep has he?

$$\begin{array}{l} \$0.23 \\ \underline{\quad\ \ 8} \\ \$1.84 \\ \underline{\ \ 0.11} \\ \$1.73 \text{ gain on 1 sheep.} \end{array} \qquad \begin{array}{l} 173\overline{)129750} \\ \qquad\quad 750 \text{ sheep. } \textit{Ans.} \end{array}$$

20. Find the prime factors of 41,580.

$$\begin{array}{r|r} 2 & 41580 \\ \hline 2 & 20790 \\ \hline 3 & 10395 \\ \hline 3 & 3465 \\ \hline 3 & 1155 \\ \hline 5 & 385 \\ \hline 7 & 77 \\ \hline & 11 \end{array}$$

$2^2, 3^3, 5, 7, 11$. *Ans.*

21. Find the G. C. M. of 144, 126, 108.

$$\begin{array}{l} 126)\,144\,(1 \\ \qquad\;\; \underline{126} \\ \qquad\;\; 18)\,126\,(7 \\ \qquad\qquad\quad \underline{126} \end{array}$$

$$\begin{array}{l} 18)\,108\,(6 \\ \qquad \underline{108} \end{array}$$

18. *Ans.*

22. Find the L. C. M. of 18, 90, 60, 24.

$$\begin{array}{r|rrrr} 2 & 18 & 90 & 60 & 24 \\ \hline 2 & \cancel{9} & 45 & 30 & 12 \\ \hline 3 & & 45 & \cancel{15} & 6 \\ \hline & & 15 & & 2 \end{array}$$

L. C. M. $= 2^3 \times 3 \times 15 = 360$. *Ans.*

23. Find the L. C. M. of 14, 35, 343.

$$\begin{array}{r|rrr} 7 & 14 & 35 & 343 \\ \hline & 2 & 5 & 49 \end{array}$$

L. C. M. $= 7 \times 2 \times 5 \times 49 = 3430$. *Ans.*

24. At $16\frac{1}{4}$ cts. a yard, what will $3\frac{1}{2}$ yds. of cloth cost?

$3\frac{1}{2} \times 16\frac{1}{4}$ cts. $= \frac{7}{2} \times \frac{65}{4} = \frac{455}{8} = 56\frac{7}{8}$ cts. \$0.57. *Ans.*

25. A man has $376\frac{2}{3}$ qts. of berries, which he wishes to put into boxes holding $2\frac{1}{4}$ qts. each. How many boxes will be required, and what part of a box will be left over?

$376\frac{2}{3} \div 2\frac{1}{4} = \frac{4}{9} \times \frac{1130}{3} = \frac{4520}{27} = 167\frac{11}{27}$.
167, and $\frac{11}{27}$ over. *Ans.*

26. If a man earns \$$2\frac{3}{4}$ a day, how many days will it take him to earn \$100?

$100 \div 2\frac{3}{4} = \frac{4}{11} \times 100 = \frac{400}{11} = 36\frac{4}{11}$. *Ans.*

27. A lady has $37\frac{1}{2}$ qts. of berries to can. If each can holds $2\frac{3}{4}$ qts., how many cans of berries will she have, and what part of another can will there be over?

$$37\frac{1}{2} \div 2\frac{3}{4} = \frac{\overset{2}{\cancel{4}}}{11} \times \frac{75}{\cancel{2}} = \frac{150}{11} = 13\frac{7}{11}.$$

13, and $\frac{7}{11}$ over. *Ans.*

28. If a man walks $4\frac{2}{3}$ miles an hour, how many hours will it take him to walk $40\frac{3}{4}$ miles?

$$40\frac{3}{4} \div 4\frac{2}{3} = \frac{3}{14} \times \frac{163}{4} = \frac{489}{56} = 8\frac{41}{56}.\ \textit{Ans.}$$

29. Some boys wanted a long rope to use on the ice. They made the rope by taking off their sled-ropes and tying them together. The first sled-rope was $2\frac{3}{4}$ yds. long, the second $3\frac{1}{2}$ yds., the third $2\frac{7}{8}$ yds., the fourth $5\frac{3}{4}$ yds., and the fifth $3\frac{2}{15}$ yds. If the whole length was shortened $1\frac{1}{3}$ yds. by the knots, from tying the sled-ropes together, how long was the rope?

L. C. D. = 120.

Numerators	90 60 105 90 16	Integers	2 3 2 5 3
Sum of numerators =	361		15

Sum of fractions = $\frac{361}{120} = 3\frac{1}{120}$

Sum of integers = 15

$18\frac{1}{120}$

$1\frac{1}{3} = 1\frac{40}{120}$

$16\frac{81}{120} = 16\frac{27}{40}$. $16\frac{27}{40}$ yds. *Ans.*

30. A lady bought $3\frac{7}{8}$ yds. of cotton cloth, $4\frac{1}{3}$ yds. of calico, $16\frac{2}{5}$ yds. of flannel, and $12\frac{1}{8}$ yds. of gingham. How many yards did she buy in all?

L. C. D. = 120.

Numerators	105 40 48 15	Integers	3 4 16 12
Sum of numerators =	208		35

Sum of fractions = $\frac{208}{120} = 1\frac{88}{120} = 1\frac{11}{15}$.

Sum of integers = 35

$36\frac{11}{15}$ $36\frac{11}{15}$ yds. *Ans.*

31. A boy went to a store with \$5.75 in his purse. He bought $3\frac{1}{4}$ lbs. of butter at 28 cts. a pound, $13\frac{1}{2}$ lbs. of sugar at 11 cts. a pound, and $1\frac{1}{2}$ lbs. of coffee at 35 cts. a pound. How much money did he have left?

$$\begin{array}{rl} 3\frac{1}{4}\text{ lbs. at }\$0.28 = & \$0.91 \\ 13\frac{1}{2}\text{ lbs. at }\ \ 0.11 = & \ \ 1.485 \\ 1\frac{1}{2}\text{ lbs. at }\ \ 0.35 = & \underline{\ \ 0.525} \\ & \$2.920 \end{array}$$

$\$5.75 - \$2.92 = \$2.83$. *Ans.*

32. Four boys went fishing, and caught 40 trout; the first caught $\frac{2}{5}$ of the whole, the second $\frac{1}{8}$, and the third $\frac{1}{4}$. How many did the fourth boy catch?

$$\begin{array}{rr} \frac{2}{5}\text{ of }40 = & 16 \\ \frac{1}{8}\text{ of }40 = & 5 \\ \frac{1}{4}\text{ of }40 = & \underline{10} \\ & 31 \end{array}$$

$40 - 31 = 9$. *Ans.*

33. George has his choice to be one of 3 boys to receive 8 oranges, or one of 4 boys to receive 11 oranges. Which shall he choose?

$\frac{1}{3}$ of $8 = 2\frac{2}{3}$. $\frac{1}{4}$ of $11 = 2\frac{3}{4}$.

$2\frac{3}{4} - 2\frac{2}{3} = \frac{1}{12}$. One of the 4. *Ans.*

34. Five girls pick blueberries together; the first picks $7\frac{2}{3}$ qts., the second $5\frac{9}{10}$ qts., the third $12\frac{3}{4}$ qts., the fourth $8\frac{1}{6}$ qts., and the fifth $3\frac{7}{8}$ qts. How much will they all together get for their berries, at $12\frac{1}{2}$ cts. a quart?

L. C. D. = 120.

$$\text{Numerators}\ \ldots\ \left\{\begin{array}{r} 80 \\ 108 \\ 90 \\ 20 \\ 105 \end{array}\right. \qquad \text{Integers}\ \ldots\ \left\{\begin{array}{r} 7 \\ 5 \\ 12 \\ 8 \\ 3 \end{array}\right.$$

Sum of numerators = 403   35

Sum of fractions = $\frac{403}{120} = 3\frac{43}{120}$

Sum of integers $= 35$

$38\frac{43}{120}$

$38\frac{43}{120} \times \$0.12\frac{1}{2} = \$4.79$. *Ans.*

35. A farmer puts the following lots of apples into 6 bins: namely, $6\frac{3}{4}$ bu., $18\frac{1}{2}$ bu., $25\frac{7}{8}$ bu., $19\frac{3}{8}$ bu., $143\frac{3}{4}$ bu., $976\frac{1}{4}$ bu., $25\frac{1}{2}$ bu. How many bushels will there be for each bin?

L. C. D. = 8.

$$\text{Numerators} \ldots \left\{\begin{array}{r} 6\\ 4\\ 7\\ 3\\ 6\\ 2\\ 4 \end{array}\right. \qquad \text{Integers} \ldots \left\{\begin{array}{r} 6\\ 18\\ 25\\ 19\\ 143\\ 976\\ 25 \end{array}\right.$$

$$\begin{array}{lrr} \text{Sum of numerators} = 32 & & 1212 \end{array}$$

$$\begin{array}{lr} \text{Sum of fractions} = \frac{32}{8} = & 4\\ \text{Sum of integers} & = \underline{1212}\\ & 1216 \end{array}$$

$\frac{1216}{6}$ bu. = $202\frac{2}{3}$ bu. *Ans.*

36. How many rods are there in 4379 ft.?

$$\begin{array}{r} 16\frac{1}{2})\,4379\\ \underline{2}\\ 33)\,8758\,(265.39\\ \underline{66}\\ 215\\ \underline{198}\\ 178\\ \underline{165}\\ 130\\ \underline{99}\\ 310\\ \underline{297}\\ 13 \end{array} \qquad 265.39 \text{ rds. } \textit{Ans.}$$

37. Reduce 9,627,834 ft. to yards, rods, etc.

$$\begin{array}{r|rl} 3 & 9627834 & \text{ft.}\\ \hline 5\frac{1}{2} & 3209278 & \text{yds.}\\ \underline{2} & \underline{2} & \\ 11 & 6418556 & \text{half-yards.}\\ \hline 320 & 583505 & \text{rds. 1 half-yard} = 1\frac{1}{2} \text{ ft.}\\ \hline & 1823 & \text{mi. 145 rds.} \end{array}$$

1823 mi. 145 rds. $1\frac{1}{2}$ ft. *Ans.*

38. Reduce 96,284 sq. in. to square feet.

$$\begin{array}{rl}
144)\,96284 & \text{sq. in.}\,(668\\
\underline{864} & \\
988 & \\
\underline{864} & \\
1244 & \\
\underline{1152} & \\
92 & \qquad 668\text{ sq. ft. }92\text{ sq. in. }\textit{Ans.}
\end{array}$$

39. Reduce 15 sq. rds. 3 sq. yds. 18 sq. ft. 3 sq. in. to square inches.

$$\begin{array}{rl}
15 & \text{sq. rds. 3 sq. yds. 18 sq. ft. 3 sq. in.}\\
\underline{30\frac{1}{4}} & \\
453\frac{3}{4} & \\
\underline{3\phantom{\frac{3}{4}}} & \\
456\frac{3}{4} & \text{sq. yds.}\\
\underline{9\phantom{\frac{3}{4}}} & \\
4110\frac{3}{4} & \\
\underline{18\phantom{\frac{3}{4}}} & \\
4128\frac{3}{4} & \text{sq. ft.}\\
\underline{144\phantom{\frac{3}{4}}} & \\
594540 & \\
\underline{3} & \\
594543 & \text{sq. in. }\textit{Ans.}
\end{array}$$

40. What will 1000 sq. ft. of land cost at $67 an acre?

$$1\text{ sq. ft.} = \frac{1}{272\frac{1}{4}\times 160}\text{ A.} = \frac{4}{1089\times 160}\text{ A.}$$

$$1000\text{ sq. ft. at }\$67\text{ an acre} = \$\frac{\overset{25}{\cancel{1000}}\times\cancel{4}\times 67}{1089\times\underset{4}{\cancel{160}}} = \$\frac{1675}{1089} = \$1.53.\ \textit{Ans.}$$

41. What will 20 sq. yds. of land cost at 75 cts. a square foot?

20 sq. yds. = (20 × 9) sq. ft. = 180 sq. ft.
180 sq. ft. at $0.75 = $135. *Ans.*

42. How much less will 15 acres of land cost, at $16 an acre, than 96,342.42 sq. ft. at 5 cts. a foot?

$$\begin{array}{lr}
96342.42\text{ sq. ft. at }\$0.05 = & \$4817.12\\
15\text{ A. at }\$16 \qquad = & \underline{240.00}\\
 & \$4577.12\ \textit{Ans.}
\end{array}$$

43. How many acres in a rectangular piece of land 9634 ft. long and 3840 ft. wide?

$$(9634 \times 3840) \text{ sq. ft.} = 36994560 \text{ sq. ft.}$$

$$1 \text{ sq. ft.} = \frac{4}{1089 \times 160} \text{ A.}$$

$$36994560 \text{ sq. ft.} = \frac{36994560 \times \cancel{4}}{1089 \times \underset{40}{\cancel{160}}} \text{ A.} = 849\tfrac{101}{363} \text{ A.} = 849 \text{ A. } 12120 \text{ sq. ft.}$$

Ans.

44. A pile of four-foot wood is 4 ft. high and 75 ft. long. How many cords of wood are there in the pile?

$1 \text{ cord} = (4 \times 4 \times 8) \text{ ft.}$

$\text{Pile} = (4 \times 4 \times 75) \text{ ft.}$

$$\text{Number of cords} = \frac{\cancel{4} \times \cancel{4} \times 75}{\cancel{4} \times \cancel{4} \times 8} = 9\tfrac{3}{8}. \text{ } \textit{Ans.}$$

45. In a woodshed there is a pile of wood 12 ft. long and 10 ft. high. If the sticks average a foot in length, what part of a cord is there in the pile?

$1 \text{ cd.} = (4 \times 4 \times 8) \text{ ft.} = 128 \text{ ft.}$

$\text{Pile} = (12 \times 10) \text{ ft.} = 120 \text{ ft.}$

$120 \text{ ft.} = \tfrac{120}{128} \text{ cd.} = \tfrac{15}{16} \text{ cd.}$ *Ans.*

46. What will 7 bu. 3 pks. of blueberries bring at 9 cts. a quart?

$$\begin{array}{r l} 7 & \text{bu. 3 pks.} \\ \underline{4} & \\ 28 & \\ \underline{3} & \\ 31 & \text{pks.} \end{array} \qquad \begin{array}{r l} 31 & \text{pks.} \\ \underline{8} & \\ 248 & \text{qts.} \\ \underline{0.09} & \\ 22.32 & \end{array} \qquad \$22.32. \textit{ Ans.}$$

47. How many gallons of milk, at 8 cts. a quart, can be bought for $7.37?

$1 \text{ gal. costs } 4 \times \$0.08 = \$0.32.$ $\qquad \frac{\$7.37}{\$0.32} = 23.$ *Ans.*

48. How many quarts of water will a tin box hold that is 13 in. long, 6 in. wide, and 7 in. deep?

$(13 \times 6 \times 7) \text{ cu. in.} = 546 \text{ cu. in.}$ $\qquad 1 \text{ qt.} = \frac{231}{4} = 57\tfrac{3}{4} \text{ cu. in.}$

$1 \text{ gal.} = 231 \text{ cu. in.}$ $\qquad \frac{546}{57.75} = 9.45.$ *Ans.*

49. The total net weight of several loads of hay is 63,782 lbs. How many tons in all the loads of hay?

63782 lbs. = $\frac{63782}{2000}$ t. = 31 t. 1782 lbs. *Ans.*

50. If an ounce of candy is worth 5 cts., what will 5 lbs. cost at the same rate?

5 lbs. = 5 × 16 oz. = 80 oz. 80 × \$0.05 = \$4. *Ans.*

51. Reduce 9 dys. 5 hrs. 16 min. to seconds.

$$\begin{array}{rl} 9 & \text{dys. 5 hrs. 16 min.} \\ \underline{24} & \\ 216 & \\ \underline{5} & \\ 221 & \text{hrs.} \\ \underline{60} & \\ 13260 & \\ \underline{16} & \\ 13276 & \text{min.} \\ \underline{60} & \\ 796560 & \text{sec. } \textit{Ans.} \end{array}$$

52. Reduce 948,741 min. to higher denominations.

$$\begin{array}{r|l} 60 & 948741 \text{ min.} \\ \hline 24 & 15812 \text{ hrs. 21 min.} \\ \hline & 658 \text{ dys. 20 hrs.} \end{array}$$

658 dys. 20 hrs. 21 min. *Ans.*

53. How many weeks between Jan. 1 and Nov. 1?

In Jan.	30 dys.
Feb.	28
March	31
April	30
May	31
June	30
July	31
August	31
Sept.	30
Oct.	31
Nov.	1

$7\overline{)304}$ dys.

43 wks. 3 dys. *Ans.*

54. A boy has 10 mi. to go. After he has gone 6 mi. 48 rds. 12 ft., how much of his journey has he still to go?

$$\begin{array}{rrrl} 10\text{ mi.} = & 9\text{ mi.} & 319\text{ rds.} & 16\frac{1}{2}\text{ ft.} \\ & 6 & 48 & 12 \\ \hline & 3\text{ mi.} & 271\text{ rds.} & 4\frac{1}{2}\text{ ft. } \textit{Ans.} \end{array}$$

55. A lady bought 4 remnants of cloth; the first contained $9\frac{1}{4}$ yds., the second 4 yds. 11 in., the third $6\frac{1}{3}$ yds., and the fourth $5\frac{1}{2}$ yds. How much cloth did she buy in all?

4 yds. 11 in. = $4\frac{11}{36}$ yds.

L. C. D. = 36.

$$\text{Numerators} \;\dots\; \left\{\begin{array}{r} 9 \\ 11 \\ 12 \\ 18 \end{array}\right. \qquad \text{Integers} \;\dots\; \left\{\begin{array}{r} 9 \\ 4 \\ 6 \\ 5 \end{array}\right.$$

Sum of numerators = 50 Sum of integers = 24

$$\begin{array}{ll} \text{Sum of fractions} = \frac{50}{36} = & 1\frac{14}{36} \\ \text{Sum of integers} \quad\;\; = & 24 \\ \hline & 25\frac{14}{36}\text{ yds.} = 25\text{ yds. }14\text{ in. } \textit{Ans.} \end{array}$$

56. A certain basket holds 1 bu. 3 pks. 7 qts. A farmer raises enough of yellow-eyed beans to fill this basket 7 times. How many bushels does he raise?

$$\begin{array}{r} 1\text{ bu. }3\text{ pks. }7\text{ qts.} \\ 7 \\ \hline 13\text{ bu. }3\text{ pks. }1\text{ qt. } \textit{Ans.} \end{array}$$

57. A farmer cuts 26 loads of hay, which average 1 t. 436 lbs. How many tons does he cut in all?

$$\begin{array}{r} 1\text{ t. }\; 436\text{ lbs.} \\ 26 \\ \hline 31\text{ t. }1336\text{ lbs. } \textit{Ans.} \end{array}$$

58. What is $\frac{1}{25}$ of 9 mi. 5 rds. 13 ft.?

$$\begin{array}{l} \qquad\qquad\qquad\qquad\qquad\quad\;\; \text{rds. ft. in.} \\ 25)\underline{9\text{ mi. }5\text{ rds. }13\text{ ft.}}(115\;\;7\;\;1\frac{11}{25} \\ \quad\;\, \underline{320} \\ \quad\;\, 2885\text{ rds.} \\ \quad\;\, \underline{2875} \\ \qquad 10 \\ \qquad \underline{16\frac{1}{2}} \\ \quad\;\, 178\text{ ft.} \\ \quad\;\, \underline{175} \\ \qquad\;\; 3 \\ \qquad \underline{12} \\ \qquad 36\text{ in.} \\ \qquad \underline{25} \\ \qquad 11 \end{array}$$

115 rds. 7 ft. $1\frac{11}{25}$ in. *Ans.*

59. Three men in company buy 175 t. 19 cwt. 36 lbs. of hay. What is each man's share?

$$\begin{array}{rrrr} & \text{t.} & \text{cwt.} & \text{lbs.} \\ 3) & 175 & 19 & 36 \\ \hline & 58 & 13 & 12 \end{array}$$

58 t. 13 cwt. 12 lbs. *Ans.*

60. Seven boys together pick 4 bu. 3 pks. 7 qts. of berries. What is each boy's share?

$$\begin{array}{rl} & 4 \text{ bu. } 3 \text{ pks. } 7 \text{ qts.} \\ & \underline{4} \\ & 16 \\ & \underline{3} \\ & 19 \text{ pks.} \\ & \underline{8} \\ & 152 \\ & \underline{7} \\ 7) & \underline{159} \text{ qts.} \\ & 22\tfrac{5}{7} \text{ qts. } \textit{Ans.} \end{array}$$

61. Bought 9 lbs. of sugar at 13 cts. a pound, 18 yds. of cloth at 33 cts. a yard, 4 doz. eggs at 29 cts. a dozen, and 5 lbs. of butter at 32 cts. a pound. What change should I receive from a ten-dollar bill given in payment?

$$\begin{array}{rrr} 9 \times \$0.13 = & \$1.17 \\ 18 \times \;\; 0.33 = & 5.94 \\ 4 \times \;\; 0.29 = & 1.16 \\ 5 \times \;\; 0.32 = & \underline{1.60} \\ & \$9.87 \end{array}$$

$\$10 - \$9.87 = \$0.13.$ *Ans.*

62. How many quarts of berries, at 12 cts. a quart, will it take to pay for 8 yds. of cloth, at 16½ cts. a yard?

$8 \times 16\tfrac{1}{2}$ cts. $= 132$ cts.

$\dfrac{132 \text{ cts.}}{12 \text{ cts.}} = 11.$ 11 qts. *Ans.*

63. A basket of peaches is half a bushel; how many bushels are there in 250 car-loads of 500 baskets each?

250×500 baskets $= 125000$ baskets.

125000 baskets $= \frac{125000}{2}$ bu. $= 62500$ bu. *Ans.*

64. A fast railway train in England went 186 mi. 240 rds. in 3 hrs. What was the rate per hour?

$$\begin{array}{rl} 3) & \underline{186 \text{ mi. } 240 \text{ rds.}} \\ & 62 \text{ mi. } \;\; 80 \text{ rds.} \end{array}$$

80 rds. $= \frac{80}{320}$ mi. $= \frac{1}{4}$ mi.

62¼ mi. *Ans.*

65. If a man could proceed to the moon at the same rate per hour as the train went in example 64, how many hours would it take him, reckoning the distance 239,000 miles?

$$\frac{239000}{62\frac{1}{4}} = \frac{239000 \times 4}{249} = 3839.36.$$

3839.36 hrs. *Ans.*

66. In one bin there are 23 bu. 2.48 pks. of wheat, and in another 141 bu. 2 pks. If ¾ of the wheat in the first bin is put into the second, how much wheat will there be in the second bin?

23 bu. 2.48 pks. = 94.48 pks.
¾ of 94.48 pks. = 70.86 pks. = 17 bu. 2.86 pks.
141 bu. 2 pks. + 17 bu. 2.86 pks. = 159 bu. 0.86 pk.

$$0.86 \text{ pk.} = \frac{0.86}{4} \text{ bu.} = 0.215 \text{ bu.} \qquad 159.215 \text{ bu. } \textit{Ans.}$$

67. A load of four-foot wood is 3½ ft. high and 7 ft. long. What is it worth at the rate of $6.40 a cord?

(4 × 4 × 8) ft. = cord.

$$\frac{\cancel{4}\times 3.5\times 7\times \$\overset{3.20}{\cancel{6.40}}}{\cancel{4}\times \underset{2}{\cancel{4}}\times 8} = \$\frac{78.40}{16} = \$4.90.\ \textit{Ans.}$$

68. In one field there are 17⅓ A., in a second there are 49 sq. rds., and a third field is 1740 ft. long and 927 ft. wide. What is the area of the three fields together?

⅓ A. = ⅓ of 160 sq. yds. = 53⅓ sq. rds. = 53 sq. rds. 90¾ sq. ft.
17⅓ A. = 17 A. 53 sq. rds. 90¾ sq. ft.

$$\begin{array}{rl} & 1740 \\ & \underline{927} \\ 272.25\overline{)1612980} & \text{sq. ft.} \\ 160\overline{)5924} & \text{sq. rds. 171 sq. ft.} \\ 37 & \text{A. 4 sq. rds.} \end{array}$$

A.	sq. rds.	sq. ft.
17	53	90¾
	49	
37	4	171
54	106	261¾

54 A. 106 sq. rds. 261¾ sq. ft. *Ans.*

69. A bin contains 164 bu. 3 pks. 2 qts. of oats. How long will these oats last if there are taken out 3 qts. of oats three times a day?

$$\begin{array}{rl} 164 & \text{bu. 3 pks. 2 qts.} \\ \underline{4} & \\ 656 & \\ \underline{3} & \\ 659 & \text{pks.} \\ \underline{8} & \\ 5272 & \\ \underline{2} & \\ 5274 & \text{qts.} \end{array} \qquad \frac{5274}{3\times 3} = 586.$$

586 dys. *Ans.*

70. From a barrel containing $27\frac{3}{4}$ gals. of oil, 3 qts. a day were taken out for 3 weeks. How many gallons were left in the barrel at the end of that time?

$$3 \times 7 \times 3 \text{ qts.} = 63 \text{ qts.}$$
$$63 \text{ qts.} = \tfrac{63}{4} \text{ gals.} = 15\tfrac{3}{4} \text{ gals.}$$
$$27\tfrac{3}{4} \text{ gals.} - 15\tfrac{3}{4} \text{ gals.} = 12 \text{ gals. } \textit{Ans.}$$

71. If from a barrel of oil holding 27 gals. 2 qts. 1 pt. there is drawn out a can full, holding 1 gal. 2 qts. 1 pt., every day, how many days will the oil last?

$$\begin{array}{rl} 27 & \text{gals. 2 qts. 1 pt.} \\ \underline{4} & \\ 108 & \\ \underline{2} & \\ 110 & \text{qts.} \\ \underline{2} & \\ 220 & \\ \underline{1} & \\ 221 & \text{pts.} \end{array} \qquad\qquad \begin{array}{rl} 1 & \text{gal. 2 qts. 1 pt.} \\ \underline{4} & \\ 4 & \\ \underline{2} & \\ 6 & \text{qts.} \\ \underline{2} & \\ 12 & \\ \underline{1} & \\ 13 & \text{pts.} \end{array}$$

$$\frac{221 \text{ pts.}}{13 \text{ pts.}} = 17. \qquad 17 \text{ dys. } \textit{Ans.}$$

72. Reduce $\frac{3}{4}$ of $\frac{5}{7}$ of $\frac{14}{19}$ of a mile to rods.

$$\frac{3}{\underset{2}{\cancel{4}}} \text{ of } \frac{5}{\cancel{7}} \text{ of } \frac{\overset{\cancel{7}}{\cancel{14}}}{19} = \frac{15}{38}. \qquad \frac{15}{\underset{19}{\cancel{38}}} \text{ of } \overset{160}{\cancel{320}} \text{ rds.} = 126\tfrac{6}{19} \text{ rds. } \textit{Ans.}$$

73. Reduce $\frac{4}{5}$ of $\frac{7}{8}$ of $3\frac{1}{2}$ in. to the fraction of a yard.

$$\frac{\overset{2}{\cancel{4}}}{5} \text{ of } \frac{7}{8} \text{ of } \frac{7}{\cancel{2}} \text{ in.} = \frac{98}{40} \text{ in.} \quad \frac{\frac{98}{40}}{36} = \frac{98}{40 \times 36} = \frac{98}{1440} = \frac{49}{720} \text{ yd. } \textit{Ans.}$$

74. If A can do a piece of work in 4 dys., B in 5 dys., and C in 7 dys., in how many days will they do it, all working together?

A does $\frac{1}{4}$ in 1 dy.
B does $\frac{1}{5}$ in 1 dy.
C does $\frac{1}{7}$ in 1 dy.

A + B + C do $\frac{1}{4} + \frac{1}{5} + \frac{1}{7}$ in 1 dy. $\frac{1}{4} + \frac{1}{5} + \frac{1}{7} = \frac{83}{140}$.

If they do $\frac{83}{140}$ in 1 dy., they will do the whole in $\frac{140}{83}$ dys. $= 1\frac{57}{83}$ dys. *Ans.*

75. A can do a piece of work in 2 hrs., B in $2\frac{1}{2}$ hrs., and C in $3\frac{1}{2}$ hrs. How much of the work can they do in 20 min., all working together?

$$\text{A does } \tfrac{1}{2} \text{ in 1 hr.} = \frac{\frac{1}{2}}{3} = \tfrac{1}{6} \text{ in 20 min.}$$

$$\text{B does } \frac{1}{\frac{5}{2}} = \tfrac{2}{5} \text{ in 1 hr.} = \frac{\frac{2}{5}}{3} = \tfrac{2}{15} \text{ in 20 min.}$$

$$\text{C does } \frac{1}{\frac{7}{2}} = \tfrac{2}{7} \text{ in 1 hr.} = \frac{\frac{2}{7}}{3} = \tfrac{2}{21} \text{ in 20 min.}$$

$$\text{A} + \text{B} + \text{C} = \tfrac{1}{6} + \tfrac{2}{15} + \tfrac{2}{21} = \frac{35 + 28 + 20}{210} = \tfrac{83}{210} \text{ in 20 min. } \textit{Ans.}$$

76. If A and B can do a piece of work in 18 dys., A and C in 12 dys., and B and C in 9 dys., find the number of days that it will take them, all working together.

$$\text{A} + \text{B can do } \tfrac{1}{18} \text{ in 1 dy.}$$

$$\text{A} + \text{C can do } \tfrac{1}{12} \text{ in 1 dy.}$$

$$\text{B} + \text{C can do } \tfrac{1}{9} \text{ in 1 dy.}$$

$$2(\text{A} + \text{B} + \text{C}) \text{ can do } \tfrac{1}{18} + \tfrac{1}{12} + \tfrac{1}{9} = \tfrac{9}{36} = \tfrac{1}{4} \text{ in 1 dy.}$$

$$\text{A} + \text{B} + \text{C can do } \frac{\frac{1}{4}}{2} = \tfrac{1}{8} \text{ in 1 dy.}$$

If they can do $\frac{1}{8}$ in 1 dy., they can do the whole in 8 dys. *Ans.*

77. A can do a piece of work in 6 dys., B in 8 dys., and C in 10 dys. How much of it can they do in 2 dys. together?

$$\text{A can do } \tfrac{1}{6} \text{ in 1 dy.}$$

$$\text{B can do } \tfrac{1}{8} \text{ in 1 dy.}$$

$$\text{C can do } \tfrac{1}{10} \text{ in 1 dy.}$$

$$\text{A} + \text{B} + \text{C can do } \tfrac{1}{6} + \tfrac{1}{8} + \tfrac{1}{10} = \tfrac{47}{120} \text{ in 1 dy.}$$

In 2 dys. they can do $2 \times \frac{47}{120} = \frac{47}{60}$. *Ans.*

78. A cistern can be filled by means of a water-pipe in 30 min., and can be emptied by a waste-pipe in 20 min. If the cistern is full, and both pipes are open, in what time will it be emptied?

Gain $= \frac{1}{30}$ in 1 min.
Loss $= \frac{1}{20}$ in 1 min.
Net loss $= \frac{1}{20} - \frac{1}{30}$ in 1 min. $= \frac{1}{60}$.
If it loses $\frac{1}{60}$ in 1 min., it will take to empty it 60 min. *Ans.*

79. From Paris to Berlin by railway is 1308^{km}. A kilometer is 1093.63 yds. Express the distance between Paris and Berlin in miles and yards.

$$1308^{km} = (1308 \times 1093.63) \text{ yds.} = 1430468.04 \text{ yds.}$$

$$1430468.04 \text{ yds.} = \frac{1430468.04}{1760} \text{ mi.} = 812 \text{ mi. } 1348.04 \text{ yds. } \textit{Ans.}$$

80. Mercury revolves around the sun in 87.9692580 dys. Express the period of revolution in days, hours, minutes, and seconds.

$$\begin{array}{rl} 87.969258 & \text{dys.} \\ 24 & \\ \hline 23.262192 & \text{hrs.} \\ 60 & \\ \hline 15.73152 & \text{min.} \\ 60 & \\ \hline 43.8912 & \text{sec.} \end{array}$$

87 dys. 23 hrs. 15 min. 43.9 sec. *Ans.*

81. The Roman foot was 0.97075 of our foot. The Greek foot was $\frac{25}{24}$ of the Roman foot. Find the length in inches of the Greek foot.

$$0.97075 \text{ ft.} = (0.97075 \times 12) \text{ in.} = 11.649 \text{ in.}$$

$$\frac{25 \times \overset{3.883}{\cancel{11.649}} \text{ in.}}{\underset{8}{\cancel{24}}} = \frac{97.075}{8} \text{ in.} = 12.134 \text{ in. } \textit{Ans.}$$

82. The radius of a circle is 0.1591549 of its circumference, which contains 360°. Find the angle at the centre whose arc is equal to the radius.

$$\begin{array}{r} 0.1591549 \\ 360 \\ \hline 57.295764^{\circ} \\ 60 \\ \hline 17.74584' \\ 60 \\ \hline 44.7504'' \end{array}$$

57° 17′ 45″. *Ans.*

83. Find the L. C. M. of all the multiples of 3, from 6 to 27, inclusive.

$$\begin{array}{r|rrrrrrrr} 3 & \cancel{6} & \cancel{9} & \cancel{12} & 15 & 18 & 21 & 24 & 27 \\ \hline 3 & & & & 5 & 6 & 7 & 8 & 9 \\ \hline & & & & 5 & \cancel{2} & 7 & 8 & 3 \end{array}$$

$$\text{L.C.M.} = 3^3 \times 5 \times 7 \times 8 = 7560. \ \textit{Ans.}$$

84. Arrange $\frac{2}{3}$, $\frac{25}{39}$, and $\frac{53}{80}$ in order of magnitude.

L. C. D. = 39 × 80 = 3120.

$\frac{2}{3} = \frac{2080}{3120}$. $\qquad \frac{53}{80} = \frac{2067}{3120}$.

$\frac{25}{39} = \frac{2000}{3120}$. $\qquad \frac{2}{3}, \frac{53}{80}, \frac{25}{39}$. *Ans.*

85. Subtract the sum of $\frac{2}{3}$, $\frac{5}{6}$, $\frac{8}{9}$, $\frac{11}{12}$, $\frac{14}{15}$ from 5.

$$\frac{2}{3}+\frac{5}{6}+\frac{8}{9}+\frac{11}{12}+\frac{14}{15}=\frac{120+150+160+165+168}{180}=\frac{763}{180}$$

$$5=\frac{5\times 180}{180}=\frac{900}{180}. \qquad \frac{900}{180}-\frac{763}{180}=\frac{137}{180}\ \textit{Ans.}$$

86. Find the decimal which, when added to the difference of $\frac{9}{200}$ and 0.002755, produces the square of 0.215.

$0.215^2 = 0.215 \times 0.215 = 0.046225.$

$\frac{9}{200}=\frac{9\times 5}{200\times 5}=\frac{45}{1000}=0.045.$

$0.045 - 0.002775 = 0.042225.$

$0.046225 - 0.042225 = 0.004.$ *Ans.*

87. A, at the rate of $4\frac{1}{4}$ miles an hour, walks a certain distance in $3\frac{1}{10}$ hrs. In what time will B walk the same distance at the rate of $\frac{3}{4}$ of $5\frac{1}{6}$ miles an hour?

$3\frac{1}{10} \times 4\frac{1}{4}$ mi. $= \frac{31}{10} \times \frac{17}{4} = \frac{527}{40}$ mi.

$\frac{3}{4}$ of $5\frac{1}{6}$ mi. $= \frac{\cancel{3}}{4}$ of $\frac{31}{\underset{2}{\cancel{6}}} = \frac{31}{8}$ mi.

$$\frac{527}{40} \div \frac{31}{8} = \frac{\cancel{8}}{\cancel{31}} \times \frac{\overset{17}{\cancel{527}}}{\underset{5}{\cancel{40}}} = \frac{17}{5} = 3\tfrac{2}{5}.$$

$3\frac{2}{5}$ hrs. *Ans.*

88. A house worth $15,000 sustains injury from fire to the amount of $3840. What is the rate per cent of loss?

$$\frac{\overset{32}{\cancel{3840}}}{\underset{125}{\cancel{15000}}} = \frac{32}{125} = 0.25\tfrac{3}{5},\text{ or }25\tfrac{3}{5}\%.\ \textit{Ans.}$$

89. A and B have each $350; A spends 16%, and B spends 20%. A's expenditure is what per cent of B's?

$\frac{16}{20} = \frac{4}{5} = 0.80 = 80\%$. *Ans.*

90. A gentleman having a court 20 ft. by 40 ft. enlarged it 10% in each dimension. Find the per cent of increase in area.

(20×40) sq. ft. $= 800$ sq. ft.
10% of $20 = 2$, and 10% of $40 = 4$.
(22×44) sq. ft. $= 968$ sq. ft.
968 sq. ft. $-$ 800 sq. ft. $= 168$ sq. ft.
$\frac{168}{800} = \frac{21}{100} = 21\%$. *Ans.*

91. A young man buys a farm for $5200, which sum is 30% more than a legacy received from his grandfather. Required the amount of the legacy.

$130\% = \frac{130}{100} = \frac{13}{10}$.
If \$5200 is $\frac{13}{10}$ of legacy, legacy $= \$\frac{10 \times 5200}{13} = \$4000$. *Ans.*

92. A lady gave to her daughter 25% and to her son 20% of her estate. The difference between the shares of the son and daughter was $1500. What is the value of the estate?

$25\% - 20\% = 5\% = \frac{1}{20}$.
If \$1500 is $\frac{1}{20}$ of estate, estate $= 20 \times \$1500 = \$30{,}000$. *Ans.*

93. If a quart of Jersey milk is worth 10 cts., and produces 1 gi. of cream worth 25 cts. a pint, what per cent of the value of the milk is the value of the cream?

1 gi. $= \frac{1}{4}$ pt.
$\frac{1}{4}$ of 25 cts. $= 6\frac{1}{4}$ cts.

$\frac{6\frac{1}{4}}{10} = \frac{62\frac{1}{2}}{100} = 62\frac{1}{2}\%$. *Ans.*

94. A farmer raised 360 bu. of potatoes, and the crop was 2400% of the seed. How many bushels did he plant?

$2400\% = \frac{2400}{100} = 24$.
If 360 bu. $= 24 \times$ the seed, the seed $= \frac{1}{24}$ of $360 = 15$ bu. *Ans.*

95. A man received from a bankrupt $937.50, which was 37½% of the sum due. What was the sum due?

$37\frac{1}{2}\% = \frac{37\frac{1}{2}}{100} = \frac{3}{8}$.

If \$937.50 is $\frac{3}{8}$ of the sum due, the sum due $= \$\frac{8 \times \overset{312.50}{\cancel{937.50}}}{\cancel{3}} = \$2500$. *Ans.*

96. What per cent of $\frac{3}{4}$ is $\frac{1}{2}$?

$$\frac{\frac{1}{2}}{\frac{3}{4}} = \frac{2}{3} = 66\frac{2}{3}\% \quad \textit{Ans.}$$

97. If 200% of a number is $\frac{1}{5}\%$ of 70, what is the number?

$\frac{1}{5}\% = \frac{\frac{1}{5}}{100} = \frac{1}{500}$. $\quad 200\% = \frac{200}{100} = 2.$ $\quad \frac{1}{500}$ of $70 = \frac{7}{50}$.

If $\frac{7}{50}$ is twice the number, the number $= \frac{1}{2}$ of $\frac{7}{50} = \frac{7}{100} = 0.07$. *Ans.*

98. A grocer sold 10% of his stock of sugar, and then 25% of the remainder, after which he had 3 t. 1560 lbs. How much sugar had he at first?

$10\% = \frac{1}{10}$; $25\% = \frac{1}{4}$.
If he sold $\frac{1}{10}$, he had $\frac{9}{10}$ left.
If he sold $\frac{1}{4}$ of the remainder, he had left $\frac{3}{4}$ of $\frac{9}{10} = \frac{27}{40}$.
3 t. 1560 lbs. = 7560 lbs.
If 7560 lbs. $= \frac{27}{40}$ of stock, the stock $= \frac{40 \times \overset{280}{\cancel{7560}}}{\cancel{27}} = 11200$ lbs.
$= 5$ t. 1200 lbs. *Ans.*

99. A man lost $37\frac{1}{2}\%$ of his money. He then earned \$50, and had 125% of what he had first. How much did he have at first?

$100\% - 37\frac{1}{2}\% = 62\frac{1}{2}\%$ left after loss.
$125\% - 62\frac{1}{2}\% = 62\frac{1}{2}\% = \frac{5}{8}$.
If \$50 is $\frac{5}{8}$ of original amount, the original amount $= \$\frac{8 \times \overset{10}{\cancel{50}}}{\cancel{5}} = \$80$. *Ans.*

100. A merchant bought a cask of molasses from which 20% of the molasses had been drawn. He sold $30\frac{1}{4}$ gals., and then the cask was one-quarter full. Find the capacity of the cask in gallons.

If 20% was drawn, there was left $80\% = \frac{4}{5}$.
$\frac{4}{5} - \frac{1}{4} = \frac{16-5}{20} = \frac{11}{20}$, amount sold.
If $30\frac{1}{4}$ gals. $= \frac{11}{20}$ of number of gallons, the number of gallons
$= \frac{20 \times \overset{2.75}{\cancel{30.25}}}{\cancel{11}} = 55$. *Ans.*

101. What per cent of a common year is the time from July 1 to November 23, both days included?

Days in July	31
August . . .	31
Sept.	30
Oct.	31
Nov.	23
	146

$\frac{146}{365} = \frac{2}{5} = 40\%$. *Ans.*

102. A horse and chaise together are valued at $225; the horse is worth 25% more than the chaise. Find the value of the horse.

Value of chaise represented by 100%.
Value of horse represented by 125%.

Value of horse and chaise represented by 225%.

$225\% = \frac{225}{100} = \frac{9}{4}$.

If \$225 is $\frac{9}{4}$ of value of chaise, value of chaise $= \$\frac{4 \times 225}{9} = \$100$.

Value of horse = $225 − $100 = $125. *Ans.*

103. A man owning 30% of a mine sold 50% of his share for $3000. What was the value of the mine?

If he sold 50% of his share, he sold $\frac{1}{2}$ of 30%, or 15%, of the mine.

$15\% = \frac{3}{20}$.

If \$3000 is $\frac{3}{20}$ of value of mine, value of mine $= \$\frac{20 \times 3000}{3} = \$20{,}000$. *Ans.*

104. For what price per pair must shoes be sold to gain 25%, if 15% is lost when they are sold at $1.275 per pair?

$100\% - 15\% = 85\%$.

$85\% = \frac{17}{20}$; $125\% = \frac{5}{4}$.

If \$1.275 is $\frac{17}{20}$ of cost, cost $= \$\frac{20 \times \overset{0.075}{\cancel{1.275}}}{\cancel{17}} = \$1.50$.

Selling price $= \frac{5}{4}$ of \$1.50 = \$1.875. *Ans.*

105. If $\frac{1}{5}$ of goods valued at $1500 are sold at a loss of 10%, what must the remainder bring to gain 20% on the whole?

$10\% = \frac{1}{10}$; $20\% = \frac{1}{5}$.
$\$1500 + \$\frac{1500}{5} = \$1800$ = price on whole.
$\frac{1}{5}$ of $1500 = $300, amount sold at loss.
$\frac{9}{10}$ of $300 = $270, amount received.
$1800 − $270 = $1530, price on remainder. *Ans.*

106. A fruit dealer bought 200 apples at the rate of 4 for a cent, and 200 at 5 for a cent. He sold them all at 5 for 3 cents. What per cent did he gain on his investment?

200 apples at 4 for 1 cent = 50 cents.
200 apples at 5 for 1 cent = 40 cents.
400 apples cost 90 cents.
400 at 5 for 3 cents = 240 cents.
Gain = 240 cents − 90 cents = 150 cents.
$\frac{150}{90} = \frac{5}{3} = 166\frac{2}{3}\%$. *Ans.*

107. If 75% of the price of a bushel of corn is 50% of the price of a bushel of wheat, how many bushels of corn can be bought for $24 when wheat is worth $1.20 a bushel?

$75\% = \frac{3}{4}$; $50\% = \frac{1}{2}$. $\frac{1}{2}$ of $1.20 = $0.60.
If $0.60 is $\frac{3}{4}$ price of corn, the price of corn $= \$\frac{4 \times 60}{3} = \$0.80$.
As many bushels at $0.80 can be bought as $24 ÷ $0.80 = 30. *Ans.*

108. A horse dealer sold a horse for $90, and lost 25% of the cost of the horse. He sold another horse at an advance of 20% on the cost, and gained as much as he lost on the first horse. What was the selling price of the second horse?

$75\% = \frac{3}{4}$; $20\% = \frac{1}{5}$.
If $90 is $\frac{3}{4}$ cost of first horse, the cost of first horse $= \$\frac{4 \times 90}{3} = \$120$.
$120 − $90 = $30, loss on first horse.
If $30 is $\frac{1}{5}$ cost of second horse, cost of second horse = 5 × $30 = $150.
Selling price of second horse = $150 + $30 = $180. *Ans.*

109. If 20 men can build a wall in 9 dys., what per cent of the number of men could build the wall in 12 dys.?

As 9 days $= \frac{3}{4}$ of 12 days $= 75\%$ of 12 days, it will require 75% of 20 men to build the wall in 12 days.

75%. *Ans.*

110. If 7% of a ton of butter costs \$42, what per cent of a ton can be bought for \$57?

$7\% = \frac{7}{100}$.

If \$42 is $\frac{7}{100}$ of value of a ton, value of a ton $= \$\frac{100 \times \overset{6}{\cancel{42}}}{\cancel{7}} = \$600$.

$\frac{57}{600} = \frac{9\frac{1}{2}}{100} = 9\frac{1}{2}\%$. *Ans.*

111. Five hundred barrels of flour were sold for \$4125, at a profit of 10%. Find the cost per barrel.

$110\% = \frac{110}{100} = \frac{11}{10}$.

If \$4125 is $\frac{11}{10}$ of cost, cost $= \$\frac{10 \times \overset{375}{\cancel{4125}}}{\cancel{11}} = \$3750$.

If 500 bbls. cost \$3750, 1 bbl. costs $\$\frac{3750}{500} = \$7.50$. *Ans.*

112. An agent makes 20% by selling a book for 72 cts. If he had sold it for \$1, what per cent would he have made?

$120\% = \frac{120}{100} = \frac{6}{5}$.

If 72 cts. is $\frac{6}{5}$ of cost, cost $= \frac{5 \times \overset{12}{\cancel{72}}\text{ cts.}}{\cancel{6}} = 60$ cts.

$\$1 - \$0.60 = \$0.40$ gain. $\frac{40}{60} = \frac{2}{3} = 66\frac{2}{3}\%$. *Ans.*

113. A merchant bought from a shoe dealer 12 cases of shoes, each containing 60 pairs, at $87\frac{1}{2}$ cts. per pair, and sold the whole for \$756. Find his gain per cent.

12×60 pairs $= 720$ pairs.
$720 \times \$0.875 = \$630$, cost.
$\$756 - \$630 = \$126$, gain.
$\frac{126}{630} = \frac{1}{5} = 20\%$. *Ans.*

114. If 196 sq. rds. are 40% of the area of a field 30 rds. in length, what is the width of the field?

$40\% = \frac{2}{5}$.

If 196 sq. rds. is $\frac{2}{5}$ of area, area $= \frac{5 \times \overset{98}{\cancel{196}}}{\cancel{2}} = 490$ sq. yds.

Width $= \frac{490}{30} = 16\frac{1}{3}$ rds. *Ans.*

115. When brooms are $5.50 a dozen, what will be paid for 18¾ gross, if a discount of 10% is allowed on the bill for cash?

$12 \times \$5.50 = \$66.00$, price per gross.
$18\frac{3}{4} \times \$66 = \$1237.50$.
$10\% = \frac{1}{10}$. $\frac{1}{10}$ of $\$1237.50 = \$123.75$.
$\$1237.50 - \$123.75 = \$1113.75$. *Ans.*

116. A grocer bought, at 60 cts. per gallon, 16 hhds. of molasses of 63 gals. each, and sold it at a profit of $120.96. What was his gain per cent?

$16 \times 63 = 1008$ gals.
$1008 \times \$0.60 = \$604.80$.
$\frac{120.96}{604.80} = \frac{1}{5} = 20\%$. *Ans.*

117. A merchant in his first year of business increased his capital 40%, and increased his capital the second year 30%. He lost 33⅓% of his capital the third year, and had $18,200 left. What was his capital at first?

$100\% + 40\% = 140\%$, capital at end of first year.
$30\% = \frac{3}{10}$. $\frac{3}{10}$ of $140\% = 42\%$. $140\% + 42\% = 182\%$, second year.
$33\frac{1}{3}\% = \frac{1}{3}$. $\frac{1}{3}$ of $182\% = 60\frac{2}{3}\%$. $182\% - 60\frac{2}{3}\% = 121\frac{1}{3}\%$, third year.
$121\frac{1}{3}\% = \frac{121\frac{1}{3}}{100} = \frac{364}{300} = \frac{91}{75}$.
If $18,200 is $\frac{91}{75}$ of original capital, original capital $= \$\frac{75 \times \overset{200}{\cancel{18200}}}{\cancel{91}}$ $= \$15,000$. *Ans.*

118 A contractor engaged to build a railroad at $31,200 a mile. The work actually cost $90 per rod. What was his gain per cent?

$320 \times \$90 = \$28800$, cost per mile.
$\$31200 - \$28800 = \$2400$, gain per mile.
$\frac{2400}{28800} = \frac{1}{12} = 8\frac{1}{3}\%$. *Ans.*

119. A merchant sold goods at 25% discount and 4% off from the selling price for cash. What was the whole per cent discount?

$100\% - 25\% = 75\%$.
$4\% = \frac{1}{25}$. $\frac{1}{25}$ of $75\% = 3\%$.
$25\% + 3\% = 28\%$. *Ans.*

120. At $1\frac{1}{2}\%$ commission an agent receives \$97.29 for selling goods. Find the amount of the sale.

$1\frac{1}{2}\% = \frac{1\frac{1}{2}}{100} = \frac{3}{200}$.

If \$97.29 is $\frac{3}{200}$ of sale, sale $= \$\frac{200 \times \overset{32.43}{\cancel{97.29}}}{\cancel{3}} = \$6486$. *Ans.*

121. A merchant sent \$30,750 to his agent in New Orleans, for the purchase of cotton. Find the sum spent for cotton, if the agent charges $2\frac{1}{2}\%$ commission for buying.

Commission on \$1 = \$0.025.

Hence on every \$1.025 sent, there is paid for cotton \$1.

That is, $\frac{100}{102\frac{1}{2}}$ of money sent is paid for cotton.

$\frac{100}{102\frac{1}{2}}$ of \$30750 $= \frac{40}{\cancel{41}}$ of $\$\overset{750}{\cancel{30750}} = \$30,000$. *Ans.*

122. Find the sum paid for insurance, at $\frac{1}{2}\%$, on a house worth \$8000, and at $\frac{3}{4}\%$ on furniture worth \$2000, if the insurance is on $\frac{7}{8}$ of the value of the property insured.

$\frac{1}{2}\% = \frac{1}{200}$; $\frac{3}{4}\% = \frac{3}{400}$. $\frac{7}{8}$ of \$8000 = \$7000.

$\frac{1}{200}$ of \$7000 = \$35 = insurance on house.

$\frac{7}{8}$ of \$2000 = \$1750.

$\frac{3}{400}$ of \$1750 = $\$13.12\frac{1}{2}$ = insurance on furniture.

\$35 + $\$13.12\frac{1}{2} = \$48.12\frac{1}{2}$ = total insurance. *Ans.*

123. A sea captain paid \$345, at $1\frac{1}{2}\%$, for insuring $\frac{2}{3}$ of the value of a ship. Find the value of the ship.

$1\frac{1}{2}\% = \frac{1\frac{1}{2}}{100} = \frac{3}{200}$.

If \$345 is $\frac{3}{200}$ of value of $\frac{2}{3}$ of ship, value of $\frac{2}{3}$ of ship $= \$\frac{200 \times \overset{115}{\cancel{345}}}{\cancel{3}}$ = \$23000.

If \$23000 is value of $\frac{2}{3}$ of ship, value of ship $= \$\frac{3 \times 23000}{2} = \$34,500$. *Ans.*

124. A town has to raise \$192,000 for expenses. If 4% is allowed for collecting, how much money must be raised?

$100 - 4\% = 96\% = \frac{96}{100} = \frac{24}{25}$.

If \$192000 is $\frac{24}{25}$ of sum to be raised, sum $= \$\frac{25 \times \overset{8000}{\cancel{192000}}}{\cancel{24}} = \$200,000$. *Ans.*

125. A merchant sends \$24,600 to his agent at St. Louis, for the purchase of flour at \$5 a barrel. How many barrels can be bought if the agent charges $2\frac{1}{2}\%$ commission for buying?

Commission on \$1 = $\$0.02\frac{1}{2}$.
Hence on every $\$1.02\frac{1}{2}$ sent, there is paid for flour \$1.
That is, $\frac{100}{102\frac{1}{2}}$ of money sent is paid for flour.
$\frac{100}{102\frac{1}{2}}$ of \$24600 = $\frac{40}{41}$ of \$24600 = \$24000.
As many barrels, at \$5 a barrel, can be bought for \$24000, as
$\$24000 \div \$5 = 4800$. *Ans.*

126. A paper-mill worth \$30,000 was insured for an annual premium of $1\frac{2}{3}\%$ on 90% of its value. In the second year it was injured by fire to the amount of \$1780. How much did the mill owner save by insuring?

$1\frac{2}{3}\% = \frac{5}{300}$; $90\% = \frac{9}{10}$.
$\frac{9}{10}$ of \$30000 = \$27000 = value insured.
$\frac{5}{300}$ of \$27000 = \$450 = premium for 1 yr.
2 × \$450 = \$900 = premium for 2 yrs.
\$1780 − \$900 = \$880 = amount saved. *Ans.*

127. A city voted a tax of \$74,500; the poll tax was \$1.25 on 2000 polls; the assessed value of city property was \$6,000,000. What was the tax on \$1000?

2000 × \$1.25 = \$2500, poll taxes.
\$74500 − \$2500 = \$72000, property tax.
Rate = $\frac{72000}{6000000} = \frac{12}{1000}$. \$12 on \$1000. *Ans.*

128. What insurance must be placed upon a store and its contents, valued at \$20,085, that the entire value of the goods and store and of a premium of $2\frac{1}{2}\%$ may be recovered in case of loss by fire?

$100\% - 2\frac{1}{2}\% = 97\frac{1}{2}\% = \frac{97\frac{1}{2}}{100} = \frac{39}{40}$.
If \$20085 is $\frac{39}{40}$ of insurance, insurance = $\$\frac{40 \times \overset{515}{\cancel{20085}}}{\cancel{39}} = \$20,600$. *Ans.*

129. A premium of $88.14 is paid upon a cargo of wheat insured at $2\frac{3}{5}\%$ on $\frac{3}{4}$ of its value. Find the number of bushels shipped, if the average price is 80 cts. a bushel.

$2\frac{3}{5}\% = \frac{2\frac{3}{5}}{100} = \frac{13}{500}.$

If $88.14 is $\frac{13}{500}$ of $\frac{3}{4}$ value, $\frac{3}{4}$ value $= \$\frac{500 \times \overset{6.78}{\cancel{88.14}}}{\cancel{13}} = \$3390.$

If $3390 is $\frac{3}{4}$ value of cargo, value of cargo $= \$\frac{4 \times \overset{1130}{\cancel{3390}}}{\cancel{3}} = \$4520.$

There were as many bushels shipped as $\$4520 \div \$0.80 = 5650$. *Ans.*

130. A 30% duty of $5594.40 was paid on 252 watches. What was the invoice price of each watch?

$30\% = \frac{3}{10}.$

If $5594.40 is $\frac{3}{10}$ of value, value $= \$\frac{10 \times \overset{1864.80}{\cancel{5594.40}}}{\cancel{3}} = \$18648.$

Value of each watch $= \$\frac{18648}{252} = \$74$. *Ans.*

131. Eleven and one-half yards of cloth $1\frac{1}{3}$ yds. wide are required for a dress. How many yards must be bought if the shrinkage in sponging is 10% in length and 8% in width?

$10\% = \frac{1}{10}$; $8\% = \frac{8}{100} = \frac{2}{25}.$

Square yards required $= 11\frac{1}{2} \times 1\frac{1}{3} = \frac{23}{\cancel{2}} \times \frac{\overset{2}{\cancel{4}}}{3} = 15\frac{1}{3}.$

Width after shrinking $= (\frac{25}{25} - \frac{2}{25})$ of $\frac{4}{3}$ yds. $= \frac{23}{25}$ of $\frac{4}{3}$ yds. $= \frac{92}{75}$ yds.

$\frac{15\frac{1}{3}}{\frac{92}{75}}$ yds. $= \frac{\cancel{46}}{\cancel{3}} \times \frac{\overset{25}{\cancel{75}}}{\underset{2}{\cancel{92}}}$ yds. $= \frac{25}{2}$ yds. $= 12\frac{1}{2}$ yds. $= \frac{9}{10}$ of required length.

Therefore required length is $\frac{\overset{5}{\cancel{10}}}{9}$ of $\frac{25}{\cancel{2}}$ yds. $= \frac{125}{9}$ yds. $= 13\frac{8}{9}$ yds. *Ans.*

132. If 30% of a merchant's sales is profit, what is his gain per cent?

On every sale of $100 he makes $30.
Hence he makes $\frac{30}{70} = \frac{3}{7} = 42\frac{6}{7}\%$. *Ans.*

133. A merchant insured a ship and cargo at $4\frac{3}{8}\%$. If $158,650 cover both property and premium, what is the value of the ship and cargo?

$104\frac{3}{8}\% = \frac{104\frac{3}{8}}{100} = \frac{835}{800} = \frac{167}{160}$

If \$158650 = $\frac{167}{160}$ of value of ship and cargo, value of ship and cargo

$$= \$\frac{160 \times \overset{950}{\cancel{158650}}}{\cancel{167}} = \$152{,}000. \textit{ Ans.}$$

134. How much money must be sent to purchase 10,000 bbls. of sugar, at \$8.50 per barrel, if the commission for buying is 3%, and the sum prepaid for freight is \$315?

10000 × \$8.50 = \$85000.
Commission = 3% or $\frac{3}{100}$ of \$85000 = \$2550.
Amount required = \$85000 + \$2550 + \$315 = \$87,865. *Ans.*

135. Find the interest of \$1000 for 2 yrs. 7 mos. 18 dys., at 6%.

Interest at 6% for

$$\begin{array}{lll} \text{2 yrs.} & & = 0.12 \\ \text{7 mos.} & = 7 \times 0.005 & = 0.035 \\ \text{18 dys.} & = 18 \times \frac{1}{6} \text{ of } 0.001 & = \underline{0.003} \\ \text{2 yrs. 7 mos. 18 dys.} & & = 0.158 \text{ of the principal.} \end{array}$$

And 0.158 of \$1000 = \$158. *Ans.*

136. Find the interest of \$1496 for 7 mos. 21 dys., at 6%.

Interest at 6% for

$$\begin{array}{lll} \text{7 mos.} & = 7 \times 0.005 & = 0.035 \\ \text{21 dys.} & = 21 \times \frac{1}{6} \text{ of } 0.001 & = \underline{0.0035} \\ \text{7 mos. 21 dys.} & & = 0.0385 \text{ of the principal.} \end{array}$$

And 0.0385 of \$1496 = \$57.596. \$57.60. *Ans.*

137. Find the interest of \$582 for 1 yr. 7 mos. 15 dys., at 6%.

Interest at 6% for

$$\begin{array}{lll} \text{1 yr.} & & = 0.06 \\ \text{7 mos.} & = 7 \times 0.005 & = 0.035 \\ \text{15 dys.} & = 15 \times \frac{1}{6} \text{ of } 0.001 & = \underline{0.0025} \\ \text{1 yr. 7 mos. 15 dys.} & & = 0.0975 \text{ of the principal.} \end{array}$$

And 0.0975 of \$582 = \$56.745. \$56.75. *Ans.*

138. Find the interest of $168 for 1 yr. 5 mos. 12 dys., at 2⅔%.

Interest at 6% for

$$\begin{array}{lll} 1 \text{ yr.} & & = 0.06 \\ 5 \text{ mos.} = 5 \times 0.005 & & = 0.025 \\ 12 \text{ dys.} = 12 \times \frac{1}{6} \text{ of } 0.001 & & = \underline{0.002} \\ 1 \text{ yr. } 5 \text{ mos. } 12 \text{ dys.} & & = 0.087 \text{ of the principal.} \end{array}$$

And 0.087 of $168 = $14.6̇16. $\frac{2\frac{2}{3}}{6} = \frac{8}{18} = \frac{4}{9}$.

$\frac{4}{\cancel{9}}$ of $\$\overset{1.624}{\cancel{14.616}} = \$6.496$. $6.50. *Ans.*

139. Find the interest of $548 for 7 mos. 18 dys., at 6½%.

Interest at 6% for

$$\begin{array}{lll} 7 \text{ mos.} = 7 \times 0.005 & & = 0.035 \\ 18 \text{ dys.} = 18 \times \frac{1}{6} \text{ of } 0.001 & & = \underline{0.003} \\ 7 \text{ mos. } 18 \text{ dys.} & & = 0.038 \text{ of the principal.} \end{array}$$

And 0.038 of $548 = $20.824. $\frac{6\frac{1}{2}}{6} = \frac{13}{12}$.

$\frac{13}{12}$ of $20.824 = $22.559. $22.56. *Ans.*

140. Find the interest of $1272 from July 12, 1880, to Feb. 24, 1882, at 3¼%.

yrs.	mos.	dys.
1882	2	24
1880	7	12
1	7	12

Interest at 6% for

$$\begin{array}{lll} 1 \text{ yr.} & & = 0.06 \\ 7 \text{ mos.} = 7 \times 0.005 & & = 0.035 \\ 12 \text{ dys.} = 12 \times \frac{1}{6} \text{ of } 0.001 & & = \underline{0.002} \\ 1 \text{ yr. } 7 \text{ mos. } 12 \text{ dys.} & & = 0.097 \text{ of the principal.} \end{array}$$

And 0.097 of $1272 = $123.384. $\frac{3\frac{1}{4}}{6} = \frac{13}{24}$.

$\frac{13}{24}$ of $123.384 = $66.83. $66.83. *Ans.*

141. Find the interest of $1975.30 for 60 dys., at 6%.

Interest at 6% for 60 dys. = 0.01 of the principal.
0.01 of $1975.30 = $19.75. *Ans.*

142. Find the interest of $1675 for 90 dys., at 6%.

Interest at 6% for 90 dys. = 0.015 of the principal.
0.015 of $1675 = $25.13. *Ans.*

143. Find the interest of $976 for 3 yrs. 6 mos., at 1% a month.

1% a month = 12% a year.
Interest at 12% for

$$\begin{array}{ll} \text{3 yrs.} & = 0.36 \\ \text{6 mos.} & = \underline{0.06} \\ \text{3 yrs. 6 mos.} & = 0.42 \text{ of the principal.} \end{array}$$

And 0.42 of $976 = $409.92. *Ans.*

144. Find the rate per cent when the interest on $3000 for 3 yrs. is $630.

Interest on $3000 for 3 yrs. is $630.
Interest on $3000 for 1 yr. = ⅓ of $630.

$$\text{Interest on \$1 for 1 yr.} = \frac{1}{\underset{100}{\cancel{3000}}} \text{ of } \frac{1}{\cancel{3}} \text{ of } \$\overset{\overset{7}{\cancel{210}}}{\cancel{630}} = \$0.07.$$

But $0.07 is 7% of $1. 7%. *Ans.*

145. Find the rate per cent when the interest on $1500 for 2 yrs. is $172.50.

Interest on $1500 for 2 yrs. is $172.50.
Interest on $1500 for 1 yr. is ½ of $172.50.

$$\text{Interest on \$1 for 1 yr. is } \frac{1}{\underset{100}{\cancel{1500}}} \text{ of } \frac{1}{\cancel{2}} \text{ of } \$\overset{\overset{5.75}{\cancel{86.25}}}{\cancel{172.50}} = \$0.05\tfrac{3}{4}.$$

But $0.05¾ is 5¾% of $1. 5¾%. *Ans.*

146. Find the rate per cent when the interest on $1278.50 for 3 yrs. 6 mos. is $178.99.

3 yrs. 6 mos. = 3½ yrs. 1 yr. = $\frac{2}{7}$ of 3½ yrs.
Interest on $1278.50 for 3½ yrs. = $178.99.
Interest on $1278.50 for 1 yr. = $\frac{2}{7}$ of $178.99.

$$\text{Interest on \$1 for 1 yr.} = \frac{1}{\underset{\underset{25}{\cancel{639.25}}}{\cancel{1278.50}}} \text{ of } \frac{\cancel{2}}{\cancel{7}} \text{ of } \$\overset{\cancel{25.57}}{\cancel{178.99}} = \$0.04.$$

But $0.04 is 4% of $1. 4%. *Ans.*

147. Find the rate per cent when a sum of money is doubled in 8 yrs.

Interest on $1 for 8 yrs. = $1.
Interest on $1 for 1 yr. = ⅛ of $1 = $0.12½.
But $0.12½ is 12½% of $1. 12½%. *Ans.*

148. Find the rate per cent when $1758 amount to $1869.34 in 8 mos.

Interest = $1869.34 − $1758 = $111.34.
8 mos. = ⅔ of a year.
Interest on $1758 for 8 mos. = $111.34.
Interest on $1758 for 1 yr. = $\frac{3}{2}$ of $111.34.

$$\text{Interest on \$1 for 1 yr.} = \frac{1}{\underset{586}{\cancel{1758}}} \text{ of } \frac{\cancel{3}}{\cancel{2}} \text{ of } \$\overset{55.67}{\cancel{111.34}} \doteq \$0.095.$$

But $0.095 is 9½% of $1. 9½%. *Ans.*

149. Find the time when the interest on $278.40, at 7½%, is $100.92.

Interest on $278.40 for 1 yr. at 7½% = $20.88.

$$\text{Number of years} = \frac{100.92}{20.88} = 4\tfrac{5}{6}.$$

4⅚ yrs. = 4 yrs. 10 mos. *Ans.*

150. Find the time when $600, at 3⅓%, amount to $660.

Interest = $660 − $600 = $60.
Interest on $600 for 1 yr. at 3⅓% = $20.
Number of years = $\frac{60}{20}$ = 3. *Ans.*

151. Find the time when the interest on $78, at 1½% a month, is $28.08.

1½% a month = 18% a year.
Interest on $78 for 1 yr. at 18% = $14.04.

$$\text{Number of years} = \frac{28.08}{14.04} = 2. \text{ } \textit{Ans.}$$

152. Find the time when the principal, at 5%, is doubled.

Interest on $\$1$ for 1 yr. at $5\% = \$0.05$.

Number of years $= \frac{1}{0.05} = 20$. *Ans.*

153. Find the principal that will produce \$424.94 interest in 3 yrs. at $5\frac{1}{2}\%$.

Interest for 1 yr. $= \$\frac{424.94}{3} = \$141.64\frac{2}{3}$.

Interest on $\$1$ for 1 yr. at $5\frac{1}{2}\% = \$0.055$.

Hence principal required $= \$\frac{141.64\frac{2}{3}}{0.055} = \$2575.39$. *Ans.*

154. Find the principal that will produce \$285.60 interest, at 7%, in 1 yr. 8 mos. 12 dys.

12 dys. $= \frac{12}{30}$ mo. $= \frac{2}{5}$ mo.

$8\frac{2}{5}$ mo. $= \frac{8\frac{2}{5}}{12} = \frac{42}{60} = 0.7$ yr.

Whole time $= 1.7$ yrs.

Interest for 1 yr. $= \$\frac{285.60}{1.7} = \$168$.

Interest on $\$1$ for 1 yr. at $7\% = \$0.07$.

Hence principal required $= \$\frac{168}{0.07} = \$2400$. *Ans.*

155. Find the principal that will produce \$81.37 interest, at $3\frac{2}{3}\%$ in 2 yrs. 9 mos. 18 dys.

18 dys. $= \frac{18}{30}$ mo. $= \frac{3}{5}$ mo. $= 0.6$.

9.6 mos. $= \frac{9.6}{12} = 0.8$ yr.

Whole time $= 2.8$ yrs.

Interest for 1 yr. $= \$\frac{81.37}{2.8} = \$29.06$.

Interest on $\$1$ for 1 yr. at $3\frac{2}{3}\% = \$0.03\frac{2}{3}$.

Hence principal required $= \$\frac{29.06}{0.03\frac{2}{3}} = \$792.55$. *Ans.*

156. What principal will amount to $88.80, at 6%, in 3 yrs. 4 mos.?

Let the principal be represented by 100.
The interest will be represented by $3\frac{1}{3} \times 6 = 20$.
The amount will be represented by $100 + 20 = 120$.

$$\text{Hence the principal} = \frac{\overset{5}{\cancel{100}}}{\underset{6}{\cancel{120}}} \text{ of } \$\overset{14.80}{\cancel{88.80}} = \$74.00. \textit{ Ans.}$$

157. What principal will amount to $308.10, at $5\frac{2}{5}$%, in 6 mos.?

Let the principal be represented by 100.
The interest will be represented by $\frac{1}{2}$ of $5\frac{2}{5} = 2.7$.
The amount will be represented by $100 + 2.7 = 102.7$.

$$\text{Hence the principal} = \frac{100}{\cancel{102.7}} \text{ of } \$\overset{3}{\cancel{308.10}} = \$300. \textit{ Ans.}$$

158. What principal will amount to $570.475, at 6%, in 3 yrs. 4 mos. 6 dys.?

6 dys. $= \frac{6}{30} = 0.2$ mo.
4.2 mos. $= \frac{4.2}{12} = 0.35$ yr.
Whole time $= 3.35$ yr.
Let the principal be represented by 100.
The interest will be represented by $3.35 \times 6 = 20.1$.
The amount will be represented by $100 + 20.1 = 120.1$.

$$\text{Hence the principal} = \frac{100}{\cancel{120.1}} \text{ of } \$\overset{4.75}{\cancel{570.475}} = \$475. \textit{ Ans.}$$

159. What principal will amount to $661.32, at $\frac{4}{5}$% a month, in 3 yrs. 6 mos.?

$\frac{4}{5}$% a month = 9.6% a year.
Let the principal be represented by 100.
The interest will be represented by $3.5 \times 9.6 = 33.6$.
The amount will be represented by $100 + 33.6 = 133.6$.

$$\text{Hence the principal} = \frac{100}{\cancel{133.6}} \text{ of } \$\overset{4.95}{\cancel{661.32}} = \$495. \textit{ Ans.}$$

160. Find the interest on $1825 from Jan. 1 to June 25, at $5\frac{1}{2}$%, counting the exact number of days, and allowing 365 dys. for a year.

From Jan. 1 to June 25 = 175 dys. = $\frac{175}{365} = \frac{35}{73}$ yr.
Interest on \$1 for 1 yr. at $5\frac{1}{2}\%$ = \$0.055.
Interest on \$1 for $\frac{35}{73}$ yr. at $5\frac{1}{2}\% = \frac{35}{73}$ of \$0.055.

Interest on \$1825 for $\frac{35}{73}$ yr. at $5\frac{1}{2}\% = \$\frac{35}{\cancel{73}} \times 0.055 \times \overset{25}{\cancel{1825}} = \$48.125$. *Ans.*

161. Find the proceeds of the following note:

\$300. SPRINGFIELD, Ill., Aug. 12, 1884.

Sixty days after date I promise to pay Nicholas Welsh, or order, \$300, value received.

Discounted at 6%, Sept. 1. JOHN BRYCE.

63 dys. from Aug. 12 is Oct. 14.
Sept. 1 to Oct. 14 is 43 dys.
Discount on \$300 for 43 dys. at 6% = \$2.15.
Proceeds = \$300 − \$2.15 = \$297.85. *Ans.*

162. Find the proceeds of the following note:

\$700. BOSTON, Nov. 13, 1880.

Ninety days after date I promise to pay to the order of David Morrison seven hundred dollars, value received.

Discounted at 7%, Jan. 1, 1881. GEORGE BROWN.

93 dys. from Nov. 13, 1880, is Feb. 14, 1881.
Jan. 1 to Feb. 14 = 44 dys.
Discount on \$700 for 44 dys. at 7% = \$5.99.
Proceeds = \$700 − \$5.99 = \$694.01. *Ans.*

163. Find the proceeds of the following note:

\$217.40. NEW YORK, July 30, 1884.

Ninety days after date I promise to pay to the order of Seth Jay two hundred seventeen and $\frac{40}{100}$ dollars, value received.

Discounted at 6%, Aug. 10, 1884. JAMES BENT.

93 dys. from July 30 is Oct. 31.
Aug. 10 to Oct. 31 = 82 dys.
Discount on \$217.40 for 82 dys. at 6% = \$2.97.
Proceeds = \$217.40 − \$2.97 = \$214.43. *Ans.*

164. Find the proceeds of the following note:

$500. CHICAGO, July 9, 1883.

Ninety days from date, for value received, I promise to pay to the order of John Hogan five hundred dollars, with interest at 9%.

Discounted at 6%, July 9, 1883. JOHN FOSTER.

Interest on note for 93 dys. = $11.62.
Amount of note when due = $500 + $11.62 = $511.62.
Time to run = 93 dys.
Discount on $511.62 for 93 dys. at 6% = $7.93.
Proceeds = $511.62 − $7.93 = $503.69. *Ans.*

165. Find the proceeds of the following note:

$5897.50. TROY, June 24, 1881.

Four months from date, for value received, I promise to pay to the order of Aaron Reed five thousand eight hundred ninety-seven and $\frac{50}{100}$ dollars, with interest at 6%.

Discounted at 5%, Aug. 15. JAMES CAREY.

Interest on note for 4 mos. 3 dys. = $120.90.
Amount of note when due = $5897.50 + $120.90 = $6018.40.
4 mos. 3 dys. from June 24 is Oct. 27.
Aug. 15 to Oct. 27 is 73 dys.
Discount on $6018.40 for 73 dys. at 5% = $61.02.
Proceeds = $6018.40 − $61.02 = $5957.38. *Ans.*

166. Find the face of a note which discounted at 6% for 90 dys. yields $344.57.

The discount on $1 for 93 dys. at 6% = $0.0155.
Proceeds of $1 is $1 − $0.0155 = $0.9845 = 0.9845 of $1.
Therefore the face required is $344.57 ÷ 0.9845 = $350. *Ans.*

167. Find the face of a note which discounted at 9% for 46 dys. yields $493.87.

The discount on $1 for 49 dys. at 9% = $0.01225.
Proceeds of $1 is $1 − $0.01225 = $0.98775 = 0.98775 of $1.
Therefore the face required is $493.87 ÷ 0.98775 = $500. *Ans.*

168. Find the face of a note which discounted at 6% for 3 mos. yields $984.50.

The discount on $1 for 3 mos. 3 dys. at 6% = $0.0155.
Proceeds of $1 is $1 − $0.0155 = $0.9845 = 0.9845 of $1.
Therefore the face required is $984.50 ÷ 0.9845 = $1000. *Ans.*

169. A note for $680, dated June 15, 1884, payable on demand, with interest at 6%, bears the following endorsement: May 15, 1885, $425. What is due June 15, 1885?

yrs.	mos.	dys.
1885	6	15
1884	6	15
1		

yrs.	mos.	dys.
1885	6	15
1885	5	15
	1	

Interest on $680 for 1 yr. at 6% = 0.06 × $680 = $40.80.
Amount = $680 + $40.80 = $720.80.
Interest on $425 for 1 mo. at 6% = $2.125.
Amount = $425 + $2.125 = $427.125.
Due $720.80 − $427.12 = $293.68. *Ans.*

170. On a note of $1400, dated March 1, 1880, there was received Oct. 19, 1880, $700; Jan. 1, 1881, $400. What is due March 1, 1881, reckoning interest at 6%?

yrs.	mos.	dys.
1881	3	1
1880	3	1
1		

yrs.	mos.	dys.
1881	3	1
1880	10	19
	4	12

yrs.	mos.	dys.
1881	3	1
1881	1	1
	2	

Interest on $1400 for 1 yr. at 6% = 0.06 × $1400 = $84.
Amount = $1400 + $84 = $1484.
Interest on $700 for 4 mos. 12 dys. at 6% = 0.022 × $700 = $15.40.
Amount = $700 + $15.40 = $715.40.
Interest on $400 for 2 mos. at 6% = 0.01 × $400 = $4.
Amount = $400 + $4 = $404.
Due $1484 − ($715.40 + $404) = $1484 − $1119.40 = $364.60. *Ans.*

171. A note of $900, dated Jan. 1, 1884, and bearing interest at 5%, has the following endorsements: May 13, $240; Aug. 19, $300; Oct. 25, $180. Required the balance due Jan. 1, 1885.

yrs.	mos.	dys.
1885	1	1
1884	1	1
1		

yrs.	mos.	dys.
1885	1	1
1884	5	13
	7	18

yrs.	mos.	dys.
1885	1	1
1884	18	19
	4	12

yrs.	mos.	dys.
1885	1	1
1884	10	25
	2	6

Interest on \$900 for 1 yr. at 5% = 0.05 × \$900 = \$45.
Amount = \$900 + \$45 = \$945.
Interest on \$240 for 7 mos. 18 dys. at 5% = $0.031\frac{2}{3}$ × \$240 = \$7.60.
Amount = \$240 + \$7.60 = \$247.60.
Interest on \$300 for 4 mos. 12 dys. at 5% = $0.018\frac{1}{3}$ × \$300 = \$5.50.
Amount = \$300 + \$5.50 = \$305.50.
Interest on \$180 for 2 mos. 6 dys. at 5% = $0.009\frac{1}{6}$ × \$180 = \$1.65.
Amount = \$180 + \$1.65 = \$181.65.
Face = \$945 – (\$247.60 + \$305.50 + \$181.65) = \$945 – \$734.75
= \$210.25. *Ans.*

172. A note of \$1800, dated Jan. 1, 1880, and bearing interest at 5%, has the following endorsement: June 1, 1881, \$400. Find the balance due June 1, 1884.

yrs.	mos.	dys.	
1881	6	1	
1880	1	1	
1	5	0	0.085
	\$400.		
1884	6	1	
1881	6	1	
3	0	0	0.18

$$\begin{array}{r}
\$1800 \\
\underline{0.085} \\
6)\overline{153.000} \\
\underline{25.50} \\
\$127.50 \\
\underline{\$1800.00} \\
\$1927.50 \\
\underline{400.00} \\
\$1527.50 \\
\underline{0.18} \\
6)\overline{274.950} \\
\underline{45.825} \\
\$229.125 \\
\underline{1527.50} \\
\$1756.63 \ \textit{Ans.}
\end{array}$$

173. A note of $600, dated Aug. 13, 1881, and bearing interest at 6%, has the following endorsements: Jan. 1, 1882, $200; April 1, 1882, $110. Find the balance due Aug. 13, 1883.

yrs.	mos.	dys.		$600
1882	1	1		0.023
1881	8	13		$13.80
				$600.00
	4	18	0.023	$613.80
	$200.			200.00
				$413.80
1882	4	1		0.015
1882	1	1		$6.207
				413.80
	3	0	0.015.	$420.01
	$110.			110.00
				$310.01
				0.082
1883	8	13		$25.42
1882	4	1		310.01
1	4	12	0.082	$335.43 *Ans.*

174. A note of $1150, dated June 30, 1878, and bearing interest at 6%, has the following endorsements: Jan. 30, 1879, $15; April 30, 1880, $570; July 30, 1881, $420. Find the balance due Dec. 30, 1882.

yrs.	mos.	dys.		$1150
1880	4	30		0.11
1878	6	30		$126.50
				1150.00
1	10	0	0.11	$1276.50
$15 + $570 = $585.				585.00
				$691.50
1881	7	30		0.075
1880	4	30		$51.86
				691.50
1	3	0	0.075	$743.36
	$420.			420.00
				$323.36
				0.085
1882	12	30		$27.49
1881	7	30		323.36
1	5	0	0.085	$350.85 *Ans.*

175. Find the compound interest f \$300, at 6%, for 3 yrs. 4 mos. 8 dys.

$$\begin{array}{r}
\$300 \\
0.06 \\ \hline
\$\ 18.00 \\
300.00 \\ \hline
\$318.00 \\
0.06 \\ \hline
\$19.08 \\
318.00 \\ \hline
\$337.08 \\
0.06 \\ \hline
\$20.2248 \\
337.08 \\ \hline
\$357.30 \\
0.023 \\ \hline
\$8.2179 \\
357.30 \\ \hline
\$365.52 \\
300.00 \\ \hline
\$65.52\ \textit{Ans.}
\end{array}$$

176. Find the compound interest f \$350, at 6%, for 3 yrs. 5 mos. 4 dys.

$$\begin{array}{r}
\$350 \\
0.06 \\ \hline
\$21.00 \\
350.00 \\ \hline
\$371.00 \\
0.06 \\ \hline
\$22.26 \\
371.00 \\ \hline
\$393.26 \\
0.06 \\ \hline
\$23.59 \\
393.26 \\ \hline
\$416.85 \\
0.029 \\ \hline
\$12.088 \\
416.85 \\ \hline
\$428.94 \\
350.00 \\ \hline
\$78.94\ \textit{Ans.}
\end{array}$$

177. Find the compound interest of \$840, at 8%, from June 13, 1880, to Aug. 1, 1881, interest being payable quarterly.

$$\begin{array}{rrr}
\text{yrs.} & \text{mos.} & \text{dys.} \\
1881 & 8 & 1 \\
1880 & 6 & 13 \\ \hline
1 & 1 & 18
\end{array}$$

Int. on \$1 for ¼ yr. at 8% = \$0.02.

$$\begin{array}{r}
\$840 \\
0.02 \\ \hline
\$16.80 \\
840. \\ \hline
\$856.80 \\
0.02 \\ \hline
\$17.136 \\
856.80 \\ \hline
\$873.936 \\
0.02 \\ \hline
\$17.4787 \\
873.936 \\ \hline
\$891.41 \\
0.02 \\ \hline
\$17.8282 \\
891.41 \\ \hline
\$909.24 \\
0.010\tfrac{2}{3} \\ \hline
\$9.698 \\
909.24 \\ \hline
\$918.94 \\
840.00 \\ \hline
\$78.94\ \textit{Ans.}
\end{array}$$

178. Find the compound interest of \$400, at 4½%, from Jan. 1, 1881, to Feb. 13, 1884.

$$\begin{array}{rrr}
\text{yrs.} & \text{mos.} & \text{dys.} \\
1884 & 2 & 13 \\
1881 & 1 & 1 \\ \hline
3 & 1 & 12
\end{array}$$

$400
0.04½
$18.00
400.00
$418.00
0.04½
$18.81
418.00
$436.81
0.04½
$19.65
436.81
$456.46
0.0052½
$2.396
456.46
$458.86
400.00
$58.86 *Ans.*

179. Find the compound interest of $1100, at 6%, for 2 yrs. 7 mos. 6 dys., interest being payable semi-annually.

$1100
0.03
$33.00
1100.00
$1133.00
0.03
$33.99
1133.00
$1166.99
0.03
$35.0097
1166.99
$1202.00
0.03
$36.06
1202.00
$1238.06
0.03
$37.1418
1238.06
$1275.20
0.006
$7.65120
1275.20
$1282.85
1100.00
$182.85 *Ans.*

180. Find the compound interest of $1000, at 8%, for 2 yrs. 3 mos. 18 dys., interest payable quarterly.

$1000
1.02
$1020.00
1.02
$1040.40
1.02
$1061.208

$1061.208
1.02
$1082.43
1.02
$1104.079
1.02
$1126.16

$1126.16
1.02
$1148.68
1.02
$1171.65
1.02
$1195.08
1.004
$1199.86
1000.00
$199.86 *Ans.*

181. Find the cost of $2400 stock, at 97½.

$$\begin{array}{r}\$2400\\ \underline{0.97\frac{1}{2}}\\ \$2340\ \textit{Ans.}\end{array}$$

182. Find the cost of $2785 stock, at 105⅕.

$$\begin{array}{r}\$2785\\ \underline{1.05\frac{1}{5}}\\ \$2929.82\ \textit{Ans.}\end{array}$$

183. Find the cost of $5680 stock, at 103¼.

$$\begin{array}{r}\$5680\\ \underline{1.03\frac{1}{4}}\\ \$5864.60\ \textit{Ans.}\end{array}$$

184. How much stock, at 85⅜, including brokerage, can be bought for $2376.84?

Since $0.85⅜, or 0.85⅜ of $1, buys $1 stock, the amount bought for $2376.84 will be $\$\frac{2376.84}{0.85\frac{3}{8}} = \$2784.$ *Ans.*

185. How much 6% stock will produce an income of $840?

If $840 is $\frac{6}{100}$ or $\frac{3}{50}$ of the amount of stock, amount of stock $= \$\frac{50 \times \overset{280}{\cancel{840}}}{\cancel{3}}$ $= \$14,000.$ *Ans.*

186. Find the price of stock, when $4647.50 will pay for $5200 worth of stock.

$5200 stock costs $4647.50.
$1 stock costs $\frac{1}{5200}$ of $4647.50 = $0.89⅜. 89⅜. *Ans.*

187. How many hundred-dollar shares of 7% stock will yield a yearly income of $686?

If $686 is $\frac{7}{100}$ of amount of stock, amount of stock $= \$\frac{100 \times \overset{98}{\cancel{686}}}{\cancel{7}}$ $= \$9800.$ 98 shares. *Ans.*

188. A gentleman gave his daughter $25,700 of 4½% bonds. What yearly income from them will she receive?

Income on $1 is $0.045.
Income on $25700 = 25700 × $0.045 = $1156.50. *Ans.*

189. What amount of 8% stock will yield a yearly income of $8000?

If $8000 is $\frac{8}{100}$ of amount of stock, amount of stock $= \$\frac{100 \times 8000}{8}$ $= \$100,000.$ *Ans.*

190. What is the rate of dividend when the sum of $300 is received from $7500 stock?

$\frac{300}{7500} = \frac{1}{25} = 4\%$. *Ans.*

191. Find the rate of dividend when the sum of $1603.80 is received from $35640 stock.

$\frac{1603.80}{35640} = 0.045 = 4\frac{1}{2}\%$. *Ans.*

192. How much stock, at 121½, can be bought for $6318?

$1 stock costs 1.215 of $1.

$6318 buys $\$\frac{6318}{1.215} = \$5200$. *Ans.*

193. How much stock, at 97½, can be bought for $1755?

$1 stock costs 0.975 of $1.

$1755 buys $\$\frac{1755}{0.975} = \$1800$. *Ans.*

194. Find the sum paid for $5600 stock, at 112¾, and brokerage ⅛.

$1 stock costs $1.12\frac{3}{4} + 0.00\frac{1}{8} = 1.12\frac{7}{8}$ of $1.

$5600 stock costs $1.12\frac{7}{8} \times \$5600 = \$6321$. *Ans.*

195. What income will be obtained from $5125, invested in 6% stock, at 102½?

$1 stock costs 1.025 of $1.

$5125 buys $\$\frac{5125}{1.025} = \$5000$ stock.

$5000 at 6% yields $0.06 \times \$5000 = \$300$. *Ans.*

196. Find the income from $8190, invested in 5% stock, at 91.

$1 stock costs 0.91 of $1.

$8190 buys $\$\frac{8190}{0.91} = \$9000$ stock.

$9000 at 5% yields $0.05 \times \$9000 = \$450$. *Ans.*

197. Find the income on $1935, invested in 8% stock, at 107½.

$1 stock costs 1.075 of $1.

$1935 buys $\$\frac{1935}{1.075} = \$1800$ stock.

$1800 at $8\% = 0.08 \times \$1800 = \$144$. *Ans*

198. Find the income from \$6750, invested in $4\frac{1}{5}$ stock, at 75.

\$1 stock costs 0.75 of \$1.

\$6750 buys $\$\frac{6750}{0.75} = \$9000$ stock.

\$9000 at $4\frac{1}{5}\% = 0.04\frac{1}{5} \times \$9000 = \$378$. *Ans.*

199. If \$7656 be invested in stock, at $63\frac{4}{5}$, and the stock pays a dividend of $3\frac{1}{4}\%$, how much will be received on the money invested?

\$1 stock costs $0.63\frac{4}{5}$ of \$1.

\$7656 buys $\$\frac{7656}{0.63\frac{4}{5}} = \$12000$ stock.

\$12000 at $3\frac{1}{4}\% = 0.03\frac{1}{4} \times \$12000 = \$390$. *Ans.*

200. If \$7000 be invested in stock, at $87\frac{1}{2}$, and the stock pays a dividend of $7\frac{1}{2}\%$, how much will be received?

\$1 stock costs $0.87\frac{1}{2}$ of \$1.

\$7000 buys $\$\frac{7000}{0.875} = \$8000$ stock.

\$8000 at $7\frac{1}{2}\% = 0.07\frac{1}{2} \times \$8000 = \$600$. *Ans.*

201. If 9% stock is bought at 150, what rate of interest will be received on the investment?

\$100 stock costs \$150.
\$100 stock pays \$9.
\$150 investment pays \$9.
Rate $= \frac{9}{150} = 0.06$ or 6%. *Ans.*

202. What rate of interest will be received on 5% stock at 75?

\$100 stock costs \$75.
\$100 stock pays \$5.
\$75 investment pays \$5.
Rate $= \frac{5}{75} = 0.06\frac{2}{3}$ or $6\frac{2}{3}\%$. *Ans.*

203. What rate of interest will be received on 4% stock, at $62\frac{1}{2}$?

\$100 stock costs $\$62\frac{1}{2}$.
\$100 stock pays \$4.
\$62.50 investment pays \$4.
Rate $= \frac{4}{62\frac{1}{2}} = 0.06\frac{2}{5}$ or $6\frac{2}{5}\%$. *Ans.*

204. How much money must be invested in 5% stock, at 80, to produce $400 income?

$5 is received from $100 stock.
$400 will be received from $\frac{400}{5} \times \$100$ stock = $8000 stock.
$100 stock costs $80.
$8000 stock costs $80 \times \$80 = \$6400$. *Ans.*

205. How much money must be invested in 4% stock, at 90, to produce $320 income?

$4 is received from $100 stock.
$320 will be received from $\frac{320}{4} \times \$100$ stock = $8000 stock.
$100 stock costs $90.
$8000 stock costs $80 \times \$90 = \$7200$. *Ans.*

206. How much money must be invested in 6% stock, at 75, to produce $200 income?

$6 is received from $100 stock.
$200 will be received from $\frac{200}{6} \times \$100$ stock = 3333.33\frac{1}{3}$.
$100 stock costs $75.
3333\frac{1}{3}$ stock costs $33\frac{1}{3} \times \$75 = \$2500$. *Ans.*

207. A man received $240 from his 6% dividend, on stock bought at 105. How much money did he have invested in the stock?

$240 = 6% of stock.

$$\text{Stock} = \$\frac{100 \times \overset{40}{\cancel{240}}}{\cancel{6}} = \$4000.$$

$100 stock costs $105.

$$\$4000 \text{ stock costs } \$\frac{105 \times 4000}{100} = \$4200. \textit{ Ans.}$$

208. What should be paid for a 4% stock, that 5% interest may be realized on the investment?

$100 must be invested to pay $5.
Hence $\frac{4}{5}$ of $100 = $80 must be invested to produce $4.
Price of stock = 80. *Ans.*

209. What should be paid for a 6% stock, that 8% interest may be ealized on the investment?

$100 must be invested to pay $8.
$\frac{6}{8}$ or $\frac{3}{4}$ of $100 = $75 must be invested to pay $6.
Price of stock = 75. *Ans.*

210. If 4% stock, which produces an income of $180, is sold at 90 vhat sum will be realized from the sale?

$100 stock pays $4.
Amount of stock = $\$\frac{100 \times 180}{4} = \$4500.$
$4500 stock at 90 = 0.90 × $4500 = $4050. *Ans.*

211. What increase of income will there be, if $3600 of 4% stock is old at 90, and the proceeds invested in 7% stock, at 108?

$3600 at 4% pays $144.
$3600 stock sold at 90 = 0.90 × $3600 = $3240.
$3240 buys $\$\frac{100 \times \overset{30}{\cancel{3240}}}{\cancel{108}} = \$3000$ stock at 108.
$3000 at 7% pays $210.
$210 − $144 = $66. *Ans.*

212. Find the increase of income, if $3900 of 3% stock is sold at 88, nd the proceeds invested in 4½% stock, at par.

$3900 at 3% pays $117.
$3900 stock sold at 88 = 0.88 × $3900 = $3432.
$3432 buys $3432 stock at par.
$3432 at 4½% pays $154.44.
$154.44 − $117 = $37.44. *Ans.*

213. Find the increase of income, if $6000 of 8% stock is sold at 120, nd the proceeds invested in 6½ stock, at 90.

$6000 at 8% pays $480.
$6000 sold at 120 yields 1.20 × $6000 = $7200.
$7200 buys $\frac{100 \times \overset{80}{\cancel{7200}}}{\cancel{90}} = \$8000$ stock at 90.
$8000 at 6½% pays 0.06½ × $8000 = $520.
$520 − $480 = $40. *Ans.*

214. If 16 bbls. of apples cost $28, what will 129 bbls. cost?

16 bbls. : 129 bbls. : : $28 : ?
16 : 129 : : $28 : ?

$$\frac{129 \times \$\overset{7}{\cancel{28}}}{\underset{4}{\cancel{16}}} = \frac{\$903}{4} = \$225.75.$$ *Ans.*

215. If 15 workmen can do a piece of work in 25 dys., in how many days can 25 men do the same work?

25 men : 15 men : : 25 dys. : ?
25 : 15 : : 25 : ?

$$\frac{15 \times \cancel{25}\text{ dys}}{\cancel{25}} = 15\text{ dys.}$$ *Ans.*

216. If 8 horses eat a certain quantity of hay in 2 mos., how long will the same quantity last 12 horses?

12 horses : 8 horses : : 2 mos. : ?
12 : 8 : : 2 mos. : ?

$$\frac{\overset{2}{\cancel{8}} \times 2\text{ mos.}}{\underset{3}{\cancel{12}}} = \frac{4}{3}\text{ mos.} = 1\frac{1}{3}\text{ mos.}$$ *Ans.*

217. A meadow can be mowed by 40 men in 10 dys. How many days will it take 30 men to mow it?

30 men : 40 men : : 10 dys. : ?
30 : 40 : : 10 dys. : ?

$$\frac{40 \times \cancel{10}\text{ dys.}}{\underset{3}{\cancel{30}}} = \frac{40}{3}\text{ dys.} = 13\frac{1}{3}\text{ dys.}$$ *Ans.*

218. If 30 men can build a wall in 18 dys., how many men will be required to build it in 12 dys.?

12 dys. : 18 dys. : : 30 men : ?
12 : 18 : : 30 men : ?

$$\frac{\overset{9}{\cancel{18}} \times \overset{5}{\cancel{30}}\text{ men}}{\underset{\cancel{2}}{\cancel{12}}} = 45\text{ men.}$$ *Ans.*

219. A bankrupt owes $3000, and his assets amount to $850. How much on a dollar will his creditors receive?

$3000 : $850 : : $1 : ?
3000 : 850 : : $1 : ?

$$\$\frac{850}{3000} = \$0.28\frac{1}{3}.$$ *Ans.*

220. What does a bankrupt pay on a dollar, if his creditors receive $376.275 on $2076?

$2076 : $376.275 : : $1 : ?
2076 : 376.275 : : $1 : ?

$$\$\frac{376.275}{2076} = \$0.18\frac{1}{8}.$$ *Ans.*

221. A bankrupt's effects amounted to \$2675.40, and his debts to \$3057.60. What did his creditors receive on a dollar?

\$3057.60 : \$2675.40 : : \$1 : ?
3057.60 : 2675.40 : : \$1 : ?

$$\$\frac{2675.40}{3057.60} = \$0.87\tfrac{1}{2}.\ \textit{Ans.}$$

222. If 4 men reap 5 A. 159 sq. rds. in 1 week, how many men at the same rate will reap 35 A. 154 sq. rds.?

5 A. 159 sq. rds. : 35 A. 154 sq. rds. : : 4 men : ?
5×160 sq. rds. + 159 sq. rds. = 959 sq. rds.
35×160 sq. rds. + 154 sq. rds. = 5754 sq. rds.
959 : 5754 : : 4 men : ?

$$\frac{\overset{6}{\cancel{5754}} \times 4 \text{ men}}{\cancel{959}} = 24 \text{ men. } \textit{Ans.}$$

223. A wall whose height is 9.1875 ft. casts a shadow of 10.5 ft. Find the length of the shadow of a steeple 93.8 ft. high.

9.1875 ft. : 93.8 ft. : : 10.5 ft. : ?
9.1875 : 93.8 : : 10.5 ft. : ?

$$\frac{93.8 \times 10.5 \text{ ft.}}{9.1875} = 107.2 \text{ ft. } \textit{Ans.}$$

224. A cistern can be filled in 54 min. by a pipe running $3\frac{7}{8}$ gals. a minute. In how many minutes can it be filled by another pipe, running $4\frac{1}{2}$ gals. a minute?

$4\frac{1}{2}$ gals. : $3\frac{7}{8}$ gals. : : 54 min. : ?
$\frac{9}{2}$: $\frac{31}{8}$: : 54 min. : ?

$$\frac{\frac{31}{8} \times 54 \text{ min.}}{\frac{9}{2}} = \frac{93}{2} \text{ min.} = 46\tfrac{1}{2} \text{ min. } \textit{Ans.}$$

225. A watch set on Saturday, at half-past eight in the evening, loses $1\frac{1}{2}$ min. in 30 hrs. What time does it show the next Thursday, at 4 o'clock in the afternoon?

Saturday 8.30 P.M. to Thursday 8.30 P.M. = 5 dys. = 120 hrs.
Thursday 4 P.M. to Thurday 8.30 P.M. = $4\frac{1}{2}$ hrs.
120 hrs. − $4\frac{1}{2}$ hrs. = $115\frac{1}{2}$ hrs.
30 hrs. : $115\frac{1}{2}$ hrs. : : $1\frac{1}{2}$ min. : loss.
30 : $115\frac{1}{2}$: : $1\frac{1}{2}$ min. : loss.

$$\frac{115.5 \times 1.5 \text{ min.}}{30} = 5.775 \text{ min.} = 5\tfrac{31}{40} \text{ min.}\quad 5\tfrac{31}{40} \text{ min. to 4. } \textit{Ans.}$$

226. When do the hour and minute hands of a watch coincide between 5 and 6 o'clock?

At 5 o'clock minute hand is 25 min. behind hour hand.
11 : 12 : : 25 min. : ?
$\frac{12 \times 25 \text{ min.}}{11} = 27\frac{3}{11}$ min. $27\frac{3}{11}$ min. past 5. *Ans.*

227. When do the hour and minute hands of a watch coincide between 8 and 9 o'clock?

At 8 o'clock minute hand is 40 min. behind hour hand.
11 : 12 : : 40 min. : ?
$\frac{12 \times 40 \text{ min.}}{11} = 43\frac{7}{11}$ min. $43\frac{7}{11}$ min. past 8. *Ans.*

228. When do the hour and minute hands of a watch coincide between 3 and 4 o'clock?

At 3 o'clock minute hand is 15 min. behind hour hand.
11 : 12 : : 15 min. : ?
$\frac{12 \times 15 \text{ min.}}{11} = 16\frac{4}{11}$ min. $16\frac{4}{11}$ min. past 3. *Ans.*

229. When do the hour and minute hands of a watch coincide between 10 and 11 o'clock?

At 10 o'clock minute hand is 50 min. behind hour hand.
11 : 12 : : 50 min. : ?
$\frac{12 \times 50 \text{ min.}}{11} = 54\frac{6}{11}$ min. $54\frac{6}{11}$ min. past 10. *Ans.*

230. A body appears to weigh $5\frac{1}{16}$ lbs. in one scale, and $5\frac{4}{9}$ lbs. in the other scale, of a false balance. Find its true weight.

$$5\tfrac{1}{16} \times 5\tfrac{4}{9} = \frac{\overset{9}{\cancel{81}}}{16} \times \frac{49}{\cancel{9}} = \frac{441}{16}.$$

$$\sqrt{\frac{441}{16}} = \frac{\sqrt{441}}{\sqrt{16}} = \frac{21}{4} = 5\tfrac{1}{4}. \quad 5\tfrac{1}{4} \text{ lbs. } \textit{Ans.}$$

231. In how many seconds will a stone fall to the bottom of a coal-pit 420 ft. deep?

$\frac{420}{16.1} = 26.087$. $\sqrt{26.087} = 5.11$. 5.11 sec. *Ans.*

232. If 60 bu. of corn feed 6 horses for 50 dys., in how many days will 15 horses consume 75 bu.?

$$\begin{array}{l}60:75\\15:\ 6\end{array}::50:? \qquad \frac{\overset{5}{\cancel{75}}\times\cancel{6}\times5\cancel{0}}{\cancel{60}\times\cancel{15}}=25.\ \textit{Ans.}$$

233. If 20 cwt. are carried 50 miles for \$5, how much will be the cost of carrying 40 cwt. 40 miles?

$$\begin{array}{l}20:40\\50:40\end{array}::\$5:? \qquad \frac{\overset{2}{\cancel{40}}\times\cancel{40}\times\$5}{\cancel{30}\times\cancel{50}}=\$8.\ \textit{Ans.}$$

234. If 20 men can perform a piece of work in 12 dys., required the number of men who can perform another piece of work three times as great in $\frac{1}{5}$ of the time.

$$\begin{array}{l}1:5\\1:3\end{array}::20:? \qquad \frac{5\times3\times20}{1\times1}=300.\ \textit{Ans.}$$

235. If 12 horses, in 5 dys., draw 44 loads of stone, how many horses will draw 132 loads the same distance in 18 dys.?

$$\begin{array}{l}18:5\\44:132\end{array}::12:? \qquad \frac{5\times\overset{\overset{2}{\cancel{12}}}{\cancel{132}}\times\overset{\cancel{3}}{\cancel{12}}}{\underset{\cancel{6}}{\cancel{18}}\times\underset{\cancel{11}}{\cancel{44}}}=10.\ \textit{Ans.}$$

236. If a footman travels 130 mi. in 3 dys., of 14 hrs. each, in how many days, of 7 hrs. each, will he travel 390 mi.?

$$\begin{array}{l}130:390\\\ \ 7:\ 14\end{array}::3:? \qquad \frac{\overset{3}{\cancel{390}}\times\overset{2}{\cancel{14}}\times3}{\cancel{130}\times\cancel{7}}=18.\ \textit{Ans.}$$

237. If 50 men dig a cellar in 7 dys., working 11 hrs. a day, how many days will 24 men require, working 8 hrs. a day?

$$\begin{array}{l}24:50\\\ 8:11\end{array}::7:? \qquad \frac{\overset{25}{\cancel{50}}\times11\times7}{\underset{12}{\cancel{24}}\times8}=\frac{1925}{96}=20\tfrac{5}{96}.\ \textit{Ans.}$$

238. A garrison of 1500 men has provisions for 12 wks., at the rate of 20 oz. per day to each man. How many men will the same provisions maintain for 20 wks., allowing each man only 8 oz. per day?

$$\begin{array}{r}20:12\\8:20\end{array}::1500:? \qquad \frac{\overset{3}{\cancel{12}}\times\cancel{20}\times\overset{750}{\cancel{1500}}}{\cancel{20}\times\underset{\cancel{2}}{\cancel{8}}}=2250.\ \textit{Ans.}$$

239. If 12 candles, of which 8 weigh a pound, serve 4 winter evenings, from five to eleven, how many candles, of which 6 weigh a pound, will serve 3 spring evenings, from seven to eleven?

5 o'clock to 11 = 6 hrs.
7 o'clock to 11 = 4 hrs.

$$\begin{array}{l}8:6\\4:3::12:?\\6:4\end{array} \qquad \frac{\cancel{6}\times3\times\cancel{4}\times\overset{3}{\cancel{12}}}{\underset{2}{\cancel{8}}\times\cancel{4}\times\cancel{6}}=\frac{9}{2}=4\tfrac{1}{2}.\ \textit{Ans.}$$

240. A contractor, having engaged to lay 10 mi. of railway in 150 dys., finds that 90 men have finished 3 mi. in 80 dys. How many more men must he engage to finish the work in the given time?

10 mi. − 3 mi. = 7 mi., to be built.
150 dys. − 80 dys. = 70 dys., to build 7 mi.

$$\begin{array}{r}3:\ 7\\70:80\end{array}::90:? \qquad \frac{\cancel{7}\times8\cancel{0}\times90}{3\times\cancel{70}}=\frac{720}{3}=240.$$

240 − 90 = 150. *Ans.*

241. If 200 men in 12 dys., of 8 hrs. each, can dig a trench 160 yds. long, 6 yds. wide, and 4 yds. deep, in how many days, of 10 hrs. each, will 90 men dig a trench 450 yds. long, 4 yds. wide, and 3 yds. deep?

(160 × 6 × 4) cu. yds. = 3840 cu. yds.
(450 × 4 × 3) cu. yds. = 5400 cu. yds.

$$\begin{array}{l}\ \ \ 90:\ 200\\\ \ \ 10:\ \ \ 8::12:?\\3840:5400\end{array}$$

$$\frac{\overset{\cancel{20}}{\cancel{200}}\times\cancel{8}\times\overset{60}{\cancel{5400}}\times\cancel{12}}{\cancel{90}\times\cancel{10}\times\underset{\underset{\underset{2}{\cancel{24}}}{\cancel{192}}}{\cancel{3840}}}=\frac{60}{2}=30.\ \textit{Ans.}$$

242. If 120 men make an embankment $\frac{3}{4}$ of a mile long, 30 yds. wide, and 7 yds. high, in 42 dys, how many men will it take to make an embankment 1000 yds. long, 36 yds. wide, and 22 ft. high, in 30 dys.?

$\frac{3}{4}$ mi. = $\frac{3}{4}$ of 1760 yds. = 1320 yds.
(1320 × 30 × 7) cu. yds. = 277200 cu. yds.
($1000 \times 36 \times 7\frac{1}{3}$) cu. yds. = 264000 cu. yds.

$$\left.\begin{matrix} 277200 : 264000 \\ 30 : \quad 43 \end{matrix}\right\} :: 120 : ?$$

$$\frac{\overset{880}{\cancel{264000}} \times \overset{14}{\cancel{42}} \times \overset{4}{\cancel{120}}}{\underset{\underset{\underset{77}{\cancel{308}}}{\cancel{924}}}{\cancel{277200}} \times \cancel{30}} = \frac{12320}{77} = 160. \textit{ Ans.}$$

243. Find the square root of 30976.

```
      3 09 76(176
      1
  27) 2 09
      1 89
 346) 20 76
      20 76
```

176. *Ans.*

244. Find the square root of 106929.

```
      10 69 29(327
      9
  62) 1 69
      1 24
 647) 45 29
      45 29
```

327. *Ans.*

245. Find the square root of 622521.

```
       62 25 21(789
       49
 148)  13 25
       11 84
 1569) 1 41 21
       1 41 21
```

789. *Ans.*

246. Find the square root of 1234321.

```
        1 23 43 21(1111
        1
   21)  23
        21
  221)  2 43
        2 21
 2221)  22 21
        22 21
```

1111. *Ans.*

247. Find the square root of 2052.09.

```
       20 52.09(45.3
       16
  85)  4 52
       4 25
 903)  27 09
       27 09
```

45.3. *Ans.*

248. Find the square root of 4795.25731.

$$\begin{array}{rl}
 & 47\ 95.25\ 73\ 10(69.247..... \\
 & \underline{36} \\
129) & 11\ 95 \\
 & \underline{11\ 61} \\
1382) & 34\ 25 \\
 & \underline{27\ 64} \\
13844) & 6\ 61\ 73 \\
 & \underline{5\ 53\ 76} \\
138487) & 1\ 07\ 97\ 10 \\
 & \underline{96\ 94\ 09}
\end{array}$$

69.247..... *Ans.*

249. Find the square root of 24674.1264.

$$\begin{array}{rl}
 & 2\ 46\ 74.12\ 64(157.08 \\
 & \underline{1} \\
25) & 1\ 46 \\
 & \underline{1\ 25} \\
307) & 21\ 74 \\
 & \underline{21\ 49} \\
31408) & 25\ 12\ 64 \\
 & \underline{25\ 12\ 64}
\end{array}$$

157.08. *Ans.*

250. Find the square root of $\frac{196}{1369}$.

$$\sqrt{\frac{196}{1369}} = \frac{\sqrt{196}}{\sqrt{1369}} = \frac{14}{37}.$$

$\frac{14}{37}$. *Ans.*

251. Find the cube root of 373248.

$$\begin{array}{r|l}
 & 373\ 248\ \underline{|72} \\
 & 343 \\
3 \times 70^2 = 14700 & 30\ 248 \\
3(70 \times 2) = 420 & \\
2^2 = \underline{4} & \\
15124 & \underline{30\ 248}
\end{array}$$

72. *Ans.*

252. Find the cube root of 54872.

$$\begin{array}{r|l}
 & 54\ 872\ \underline{|38} \\
 & 27 \\
3 \times 30^2 = 2700 & 27\ 872 \\
3(30 \times 8) = 720 & \\
8^2 = \underline{64} & \\
3484 & \underline{27\ 872}
\end{array}$$

38. *Ans.*

253. Find the cube root of 389017.

$$\begin{array}{r|l}
 & 389\ 017\ \underline{|73} \\
 & 343 \\
3 \times 70^2 = 14700 & 46\ 017 \\
3(70 \times 3) = 630 & \\
3^2 = \underline{9} & \\
15339 & \underline{46\ 017}
\end{array}$$

73. *Ans.*

254. Find the cube root of 1092727.

$$\begin{array}{rr|l}
 & & \multicolumn{1}{l}{1\,092\,727\,|\underline{103}} \\
 & & \multicolumn{1}{l}{1} \\ \cline{3-3}
3\times100^2 = & 30000 & 92\,727 \\
3(100\times3) = & 900 & \\
3^2 = & \underline{9} & \\
 & 30909 & \underline{92\,727}
\end{array}$$

103. *Ans.*

255. Find the cube root of 84604519.

$$\begin{array}{rrl|l}
 & & & \multicolumn{1}{l}{84\,604\,519\,|\underline{439}} \\
 & & & \multicolumn{1}{l}{64} \\ \cline{4-4}
3\times40^2 = & 4800 & & 20\,604 \\
3(40\times3) = & 360 & & \\
3^2 = & \underline{9} & & \\
 & 5169 & \Bigg\} & \underline{15\,507} \\
 & \underline{369} & & 5\,097\,519 \\
3\times430^2 = & 554700 & & \\
3(430\times9) = & 11610 & & \\
9^2 = & \underline{81} & & \\
 & 566391 & & \underline{5\,097\,519}
\end{array}$$

439. *Ans.*

256. Find the cube root of 52734.375.

$$\begin{array}{rrl|l}
 & & & \multicolumn{1}{l}{52\,734.375\,|\underline{37.5}} \\
 & & & \multicolumn{1}{l}{27} \\ \cline{4-4}
3\times30^2 = & 2700 & & 25\,734 \\
3(30\times7) = & 630 & & \\
7^2 = & \underline{49} & & \\
 & 3379 & \Bigg\} & \underline{23\,653} \\
 & \underline{679} & & 2\,081\,375 \\
3\times370^2 = & 410700 & & \\
3(370\times5) = & 5550 & & \\
5^2 = & \underline{25} & & \\
 & 416275 & & \underline{2\,081\,375}
\end{array}$$

37.5. *Ans.*

257. Find the cube root of 7834.87438.

	7 834.874 380	19.86
	1	
$3\times10^2=300$	6 834	
$3(10\times9)=270$		
$9^2=81$		
651	5 859	
351	975 874	
$3\times190^2=108300$		
$3(190\times8)=4560$		
$8^2=64$	903 392	
112924	72 4820	
4624		
$3\times198^2=117612$	70 5672	19.86..... *Ans.*

258. Find the cube root of 0.053157376.

	0.053 157 376	0.376
	27	
$3\times30^2=2700$	26 157	
$3(30\times7)=630$		
$7^2=49$		
3379	23 653	
679	2 504 376	
$3\times370^2=410700$		
$3(370\times6)=6660$		
$6^2=36$		
417396	2 504 376	0.376. *Ans.*

259. Find the cube root of $\frac{4}{7}$.

7)4.0000000	0.571 428 571	0.829
0.5714285 etc.	512	
$3\times80^2=19200$	59 428	
$3(80\times2)=480$		
$2^2=4$		
19684	89 363	
484	20 060 571	
$3\times820^2=2017200$		
$3(820\times9)=22140$		
$9^2=81$		
2039421	18 354 789	0.829..... *Ans.*

260. Find the cube root of $7\frac{1}{5}$.

$$\begin{array}{rrc|ll}
 & & & 7.200\ 000 & \underline{|1.93} \\
 & & & \underline{1} & \\
3\times10^2 = & 300 & & 6\ 200 & \\
3(10\times9) = & 270 & & & \\
9^2 = & \underline{81} & & & \\
 & 651 & \} & \underline{5\ 859} & \\
 & \underline{351} & & \quad 341\ 000 & \\
3\times190^2 = & 108300 & & & \\
3(190\times3) = & 1710 & & & \\
3^2 = & \underline{9} & & & \\
 & 110019 & & \underline{\quad 330\ 057} & 1.93.\ \textit{Ans.}
\end{array}$$

261. What is the total surface of a cube, the edge of which measures $4\frac{1}{2}$ in.?

The total surface consists of 6 squares, each $4\frac{1}{2}$ in. on a side.
Hence, total surface $= 6 \times 4.5^2 = 121.5$ sq. in. *Ans.*

262. How many planks, each 15 ft. long, and 10 in. wide, will be required for the flooring of a room 30 ft. in length and $22\frac{1}{2}$ ft. in width?

$$10 \text{ in.} = \tfrac{5}{6} \text{ ft.} \qquad \frac{30\times22\frac{1}{2}}{15\times\frac{5}{6}} = \frac{675}{12\frac{1}{2}} = 54.\ \textit{Ans.}$$

263. A square court, whose side is 42 yds., is paved with 28,224 square tiles. Find the dimensions of each tile.

$$\begin{array}{rl}
 & 42 \text{ yds.} \\
 & \underline{42} \\
 & 1764 \text{ sq. yds.} \\
 & \underline{9} \\
 & 15876 \text{ sq. ft.} \\
 & \underline{144} \\
28224 & \!\!\overline{)2286144} \text{ sq. in.} \\
 & 81 \text{ sq. in.}
\end{array}$$

A tile contains 81 sq. in., and is 9 in. square. *Ans.*

264. Find the area of a triangle whose base is 9 ft. 8 in., and whose altitude is 5 ft. 3 in.

$$9\tfrac{2}{3}\times5\tfrac{1}{4} = \frac{29}{\cancel{3}}\times\frac{\overset{7}{\cancel{21}}}{4} = \frac{203}{4}. \qquad \tfrac{1}{2} \text{ of } \tfrac{203}{4} = \tfrac{203}{8} = 25\tfrac{3}{8}.\ \textit{Ans.}$$

265. How many yards of carpeting, 1 yd. wide, will be required for a room 27 ft. long, and 21 ft. 3 in. wide, if the strips run across the room?

27 ft. = 9 yds. $\frac{9}{1} = 9$ strips.

$9 \times 21\frac{1}{4}$ ft. = $191\frac{1}{4}$ ft. = $63\frac{3}{4}$ yds. *Ans.*

266. How many yards in the side of a square field containing 3 A. 44 sq. rds. 25 sq. yds.?

$$\begin{array}{r l}
3 & \text{A. 44 sq. rds. 25 sq. yds.} \\
\underline{160} & \\
480 & \\
\underline{44} & \\
524 & \text{sq. yds.} \\
\underline{30\frac{1}{4}} & \\
15851 & \\
\underline{25} & \\
15876 & \text{sq. yds.}
\end{array}$$

$$\begin{array}{r l}
 & 1\;58\;76\,(126 \\
 & \underline{1} \\
22) & 58 \\
 & \underline{44} \\
246) & 14\;76 \\
 & \underline{14\;76}
\end{array}$$

126 yds. *Ans.*

267. The weight of a cubic inch of water is 253.17 grs.; that of a cubic inch of air, 0.31 grs. Find to three places of decimals the number of cubic inches of water equal in weight to 1 cu. ft. of air.

$$\begin{array}{r l}
1728 & \text{cu. in.} = 1 \text{ cu. ft.} \\
\underline{0.31} & \\
535.78 & \text{grs.}
\end{array}$$

$$\begin{array}{r r}
 & \underline{2.115} \\
25317) & 53568 \\
 & \underline{50634} \\
 & 29340 \\
 & \underline{25317} \\
 & 40230 \\
 & \underline{25317} \\
 & 149130 \\
 & \underline{126585} \\
 & 22545
\end{array}$$

2.116. *Ans.*

268. How many cubic feet in a piece of timber 18 ft. long, 15 in. wide, and 10 in. thick?

15 in. = $\frac{15}{12} = \frac{5}{4}$ ft. 10 in. = $\frac{10}{12} = \frac{5}{6}$ ft.

Hence number of cubic feet is $\overset{3}{\cancel{18}} \times \frac{5}{4} \times \frac{5}{\cancel{6}} = \frac{75}{4} = 18\frac{3}{4}$. *Ans.*

269. The sides of a triangular garden are 52, 64, and 72 yds. respectively. Find the area.

$\frac{1}{2}$ of $(52 + 64 + 72) = 94.$

$94 - 52 = 42. \quad 94 - 64 = 30. \quad 94 - 72 = 22.$

$$\text{Area} = \sqrt{94 \times 42 \times 30 \times 22} = \sqrt{2^4 \times 3^2 \times 47 \times 7 \times 5 \times 11}$$
$$= 12\sqrt{47 \times 7 \times 5 \times 11} = 12\sqrt{18095}$$
$$= 12 \times 134.518 = 1614.21 \text{ sq. yds. } \textit{Ans.}$$

270. Find the circumference and area of a circle whose radius is 2 ft. 4 in.

Radius = 2 ft. 4 in. = 28 in.

Diameter = 56 in.

Circumference = 3.1416 × 56 in. = 175.9 in. *Ans.*

Area = 3.1416 × 28 × 28 = 2463 sq. in. *Ans.*

271. The side of an equilateral triangle is 12 ft. Find its area.

$\frac{1}{2}$ of $(12 + 12 + 12) = 18. \quad 18 - 12 = 6.$

$$\text{Area} = \sqrt{18 \times 6 \times 6 \times 6} = 36\sqrt{3}$$
$$= 36 \times 1.732 = 62.35 \text{ sq. ft. } \textit{Ans.}$$

272. How many bricks, each 9 in. long, $4\frac{1}{2}$ in. wide, and 3 in. thick, will be required for a wall 175 yds. long, 12 ft. high, and 1 ft. $10\frac{1}{2}$ in. thick?

175 yds. = 175 × 36 in. 12 ft. = 12 × 12 in. 1 ft. $10\frac{1}{2}$ in. = $22\frac{1}{2}$ in.

$$\frac{175 \times \overset{4}{\cancel{36}} \times 12 \times \overset{4}{\cancel{12}} \times \overset{5}{\cancel{22\frac{1}{2}}}}{\cancel{9} \times \cancel{4\frac{1}{2}} \times \cancel{3}} = 168{,}000. \ \textit{Ans.}$$

273. The diameter of a circular shaft in a railway tunnel is 5 ft., and its depth 30 fathoms. How many cubic feet of earth were dug out in making it?

Diameter = 5 ft. Radius = $2\frac{1}{2}$ ft. 30 fathoms = 180 ft.

Area of base = $3.1416 \times \frac{5}{2} \times \frac{5}{2} = 19.635$ sq. ft.

180 × 19.635 = 3534.3 cu. ft. *Ans.*

274. Find the cost of plastering a room 25 ft. 6 in. long, 17 ft. 3 in. wide, and 10 ft. 8 in. high. The price for the walls is 21 cts., and for the ceiling 32 cts. a square yard, and no allowance is made for doors and windows.

Circuit = $2 \times 25\frac{1}{2}$ ft. + $2 \times 17\frac{1}{4}$ ft. = $85\frac{1}{2}$ ft.

Area of walls = $85\frac{1}{2} \times 10\frac{2}{3} = \frac{\overset{57}{\cancel{171}}}{\cancel{2}} \times \frac{\overset{16}{\cancel{32}}}{\cancel{3}} = 912$ sq. ft. = 101 sq. yds.

Area of ceiling = $25\frac{1}{2} \times 17\frac{1}{4} = \frac{51}{2} \times \frac{69}{4} = \frac{3519}{8} = 439\frac{7}{8}$ sq. ft.
= 49 sq. yds.

101 × 21 cts. = $21.28
49 × 32 cts. = 15.68
$36.89 *Ans.*

275. A line 62 ft. long reaches from the top of a house 48 ft. high, to the bottom of a house on the opposite side of the street. Find the width of the street.

$$\begin{array}{r} 62 \\ \underline{62} \\ 3844 \end{array} \qquad \begin{array}{r} 48 \\ \underline{48} \\ 2304 \end{array}$$

3844 − 2304 = 1540.

$$\begin{array}{rl} & 15\,40\,(39.24 \\ & \underline{9} \\ 69) & 6\,40 \\ & \underline{6\,21} \\ 782) & 19\,00 \\ & \underline{15\,64} \\ 7844) & 3\,36\,00 \\ & \underline{3\,13\,76} \end{array}$$

39.24 ft. *Ans.*

276. Find the capacity in bushels of a round basket 20 in. in diameter and 28 in. deep.

Diameter = 20 in. Radius = 10 in.

$$\frac{10 \times 10 \times 3.1416 \times 28}{2150.42}$$

$$\begin{array}{r} 3.1416 \\ \underline{28} \\ 87.9648 \\ \underline{100} \end{array}$$

$$\begin{array}{rl} 2150.42) & 8796.48\,(4.09 \\ & \underline{8601\,68} \\ & 194\,8000 \\ & \underline{193\,5378} \end{array}$$

4.09 bu. *Ans.*

277. The diameter of a spherical balloon is 25 ft. How many square yards of silk were required to make it, and how many cubic feet of gas will be required to fill it?

3.1416
25^2 = 625
Area = 1963.5 sq. ft. = 218⅙ sq. yds. *Ans.*
The volume = area ot surface × ⅓ of the radius.
1963.5
½ of 25 = 12.5 = radius.
3)24543.75
Volume = 8181.25 cu. ft. *Ans.*

278. Find the weight of an ivory ball 2 in. in diameter, the weight of ivory being 1825 oz. a cubic foot.

If 1 cu. ft. weighs 1825 oz., 1 cu. in. weighs $\frac{1825}{1728}$ = 1.056 oz.

3.1416
2^2 = 4
Area = 12.5664 sq. in.
⅓ of radius = ⅓
Volume = 4.1888 cu. in.
1.056
4.4244728 4.42 oz. *Ans.*

279. How many cubic feet in a stone roller 6 ft. 6 in. long and 5 ft. 4 in. in circumference?

5 ft. 4 in. = 5.333 ft.
6 ft. 6 in. = 6.5 ft.

1.6976
31416)53333.3
31416
219173
188496
306773
282744
240293
219912
203813
188496
15317

Diameter = 1.6976 ft.
Radius = 0.8488
0.8488
67904
67904
33952
67904
Square of radius = 0.72046144

3.1416
0.72
62832
219912
Area of base = 2.261952 sq. ft.
Length of roller = 6.5
11309760
13571712
Volume = 14.7026880 cu. ft.

14.7 cu. ft. *Ans.*

Ex. 165. (*Oral.*) Page 321.

1. How many meters in a dekameter? hectometer? kilometer? How many dekameters in a hectometer? kilometer?

10; 100; 1000; 10; 100. *Ans.*

2. What part of a meter is a decimeter? centimeter? millimeter? What part of a centimeter is a millimeter?

$\frac{1}{10}$; $\frac{1}{100}$; $\frac{1}{1000}$; $\frac{1}{10}$. *Ans.*

3. Read 32.3^{m}; 12.6^{cm}; 15.4^{km}; 59.8^{mm}.

Thirty-two and three-tenths meters; twelve and six-tenths centimeters; fifteen and four-tenths kilometers; fifty-nine and eight-tenths millimeters.

4. Express 3256^{m} as kilometers; as centimeters.

3.256^{km}; $325{,}600^{\mathrm{cm}}$. *Ans.*

5. Express 5368^{mm} as centimeters; as meters.

536.8^{cm}; 5.368^{m}. *Ans.*

6. Express 12.4^{km} as meters; as centimeters.

$12{,}400^{\mathrm{m}}$; $1{,}240{,}000^{\mathrm{cm}}$. *Ans.*

Ex. 166. Page 321.

1. Find the value of
$0.435^{\mathrm{m}} + 852^{\mathrm{cm}} + 4263^{\mathrm{mm}} + 0.1595^{\mathrm{km}}$
in meters.

$$\begin{array}{r} 0.435^{\mathrm{m}} \\ 8.520^{\mathrm{m}} \\ 4.263^{\mathrm{m}} \\ 159.500^{\mathrm{m}} \\ \hline 172.718^{\mathrm{m}} \end{array} \textit{ Ans.}$$

2. Find the values of
$0.927^{\mathrm{km}} - 6495^{\mathrm{cm}}$; $4.37^{\mathrm{cm}} - 42.87^{\mathrm{mm}}$
in meters.

$$\begin{array}{r} 927.00^{\mathrm{m}} \\ 64.95 \\ \hline 862.05^{\mathrm{m}} \end{array} \textit{ Ans.}$$

$$\begin{array}{r} 0.04370^{\mathrm{m}} \\ 0.04287 \\ \hline 0.00083^{\mathrm{m}} \end{array} \textit{ Ans.}$$

3. Find the values of
$8 \times 0.0457^{\mathrm{km}}$; $3.04 \times 60.93^{\mathrm{cm}}$;
$5.43 \times 67.2^{\mathrm{mm}}$ in meters.

$$\begin{array}{r} 45.7^{\mathrm{m}} \\ 8 \\ \hline 365.6^{\mathrm{m}} \end{array} \textit{ Ans.}$$

$$\begin{array}{r} 0.6093^{\mathrm{m}} \\ 3.04 \\ \hline 1.852272^{\mathrm{m}} \end{array} \textit{ Ans.}$$

$$\begin{array}{r} 0.0672^{\mathrm{m}} \\ 5.43 \\ \hline 0.364896^{\mathrm{m}} \end{array} \textit{ Ans.}$$

4. Find the values of $38{,}019^{mm} \div 0.097$; $0.41^{km} \div 25.625$ in meters.

$0.097)38.019^{m}(391.94845^{m}$ *Ans.*

$25.625)410.000^{m}(16^{m}$ *Ans.*

5. A book is 2.1^{cm} thick; if the average thickness of the leaves is 0.05^{mm}, find the number of pages in the book.

$$0.05^{mm})\underline{21^{mm}}$$
$$420$$

$2 \times 420 = 840$. *Ans.*

6. The expense of building a certain railroad is $25,000 on the average per kilometer. What is the whole cost of the road, if its length is 72^{km} and 53^{m}?

$$\begin{array}{r} 72.053^{km} \\ \underline{25000} \\ 1801325.000 \end{array}$$

$1,801,325. *Ans.*

7. The wheels of a locomotive that makes 45^{km} an hour are 7.5^{m} in circumference. How many revolutions will they make a minute?

$$\begin{array}{r|l} 60 & 45000^{m} \\ 7.5 & \underline{\quad 750^{m}} \text{ per min.} \\ & \quad 100 \text{ } \textit{Ans.} \end{array}$$

8. A locomotive runs 1284^{m} in $1\frac{1}{2}$ min. How many kilometers will it go in 1 hr. 35 min. 15 sec.?

1 hr. 35 min. 15 sec. = $95\frac{1}{4}$ min.

$$\begin{array}{r} 3)\underline{1284^{m}} \\ 428 \\ \underline{2} \\ 856^{m} \text{ a min.} \\ \underline{95\frac{1}{4}} \\ 81{,}534^{m} \end{array}$$

81.534^{km}. *Ans.*

9. The top of a monument is 143.9^{m}, and the base 67.19^{m} above the level of the sea; the steps which lead from the base to the top of the monument are each 19^{cm} high. How many steps are there?

$$\begin{array}{r} 143.9^{m} \\ \underline{67.19} \\ 76.71^{m} \text{ height of monument.} \\ \underline{100} \\ 19^{cm})\underline{7671^{cm}} \\ 404 \text{ } \textit{Ans.} \end{array}$$

Ex. 167. (*Oral.*) Page 323.

1. How many square meters in a square dekameter? square hectometer? square kilometer?

100; 10,000; 1,000,000. *Ans.*

2. How many centars in an ar? in a hektar?

100; 10,000. *Ans.*

3. What part of a hektar is an ar? a centar?

0.01; 0.0001. *Ans.*

4. What part of a square meter is a square decimeter? square millimeter?

0.01; 0.000001. *Ans.*

5. Read 56.4^{qm}; 2.05^{qkm}; 531.6^{qcm}.

Fifty-six and four-tenths square meters; Two and five one-hundredths square kilometers; Five hundred thirty-one and six-tenths square centimeters. *Ans.*

6. Read 53^{a}; 36.03^{ha}; 56^{ca}; 56^{qm}.

Fifty-three ars; Thirty-six and three-hundredths hectars; Fifty-six centars; Fifty-six square meters. *Ans.*

Ex. 168. Page 323.

1. Convert $1,854,276^{qm}$ into hektars; into square kilometers.

$1854276^{qm} = 185.4276^{ha}$. *Ans.* $1854276^{qm} = 1.854276^{qkm}$. *Ans.*

2. How many hektars in 2.7856^{qkm}?

$2.7856^{qkm} = 2785600^{qm} = 278.56^{ha}$. *Ans.*

3. Write 1.7431^{qm} as square centimeters; as square millimeters.

17431^{qcm}. *Ans.* $1,743,100^{qmm}$. *Ans.*

4. How many square kilometers in $17,467.5^{ha}$?

$17467.5^{ha} = 174675000^{qm} = 174.675^{qkm}$. *Ans.*

5. How many square meters in 1.3614^{qkm}?

$1.3614^{qkm} = 1,361,400^{qm}$. *Ans.*

6. How many square meters in 2.25^{ha}? $2.25^{ha} = 22,500^{qm}$. *Ans.*

7. How many square centimeters in 0.0137 of a square meter?

$0.0137^{qm} = 137^{qcm}$. *Ans.*

8. Write 3.571^{qcm} as square millimeters. $3.571^{qcm} = 357.1^{qmm}$. *Ans.*

9. A man bought 3^{ha} of land at $200 per hektar, and sold it for $2.50 per ar. How much did he gain?

3^{ha} at \$200 = \$600. 300^{a} at \$2.50 = \$750.
$3^{ha} = 300^{a}$. \$750 − \$600 = \$150. *Ans.*

10. If 6^{ha} are divided into 64 equal lots, how many square meters will there be in each lot?

$6^{ha} = 60000^{qm}$.

$$64\underline{)60000}$$
937.5 *Ans.*

Ex. 169. (*Oral.*) Page 325.

1. In a cubic meter, how many cubic decimeters? cubic centimeters?

1000; 1,000,000. *Ans.*

2. What part of a cubic meter is a cubic decimeter? 0.001. *Ans.*

3. What part of a cubic meter is a cubic centimeter? 0.000001. *Ans.*

4. What part of a cubic decimeter is a cubic centimeter? 0.001. *Ans.*

5. How many liters in a hektoliter? 100. *Ans.*

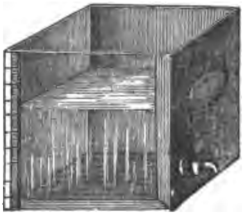
6. How many liters in a cubic meter? 1000. *Ans.*

7. How many cubic centimeters in a liter? 1000. *Ans.*

8. Express 7685.25^{l} as cubic meters; as hektoliters.

7.68525^{cbm}; 76.8525^{hl}. *Ans.*

9. If the water in the liter represented in the margin stands 6^{cm} high, how many *cubic centimeters* of water are there in the measure? How many will be required to fill it? If the faucet be turned, and the water allowed to run out until the measure is only a quarter full, how many cubic centimeters will run out? How many will still remain?



600^{ccm}; 400^{ccm}; 350^{ccm}; 250^{ccm}. *Ans.*

Ex. 170. Page 325.

1. How many cubic meters in a rectangular box 125^{cm} long, 112^{cm} wide, and 80^{cm} deep? how many liters?

$$125 \times 112 \times 80 = 1120000^{ccm}.$$
$$1120000^{ccm} = 1.12^{cbm}.\ \textit{Ans.}$$
$$1.12^{cbm} = 1.12 \times 1000^{l} = 1120^{l}.\ \textit{Ans.}$$

2. How many cubic meters of earth must be removed to dig a ditch 90^{m} long, 85^{cm} wide, and 50^{cm} deep?

$$90 \times 0.85 \times 0.50 = 38.25^{cbm}.\ \textit{Ans.}$$

3. How deep must a cistern be to hold 6000^{l}, if the bottom is a square measuring 2.25^{m} on a side?

$6000^{l} = 6^{cbm}$. $2.25^{m} = 2\frac{1}{4}^{m}$.
$2\frac{1}{4} \times 2\frac{1}{4} = \frac{81}{16}$; bottom $= \frac{81}{16}^{qm}$.

$$\frac{\overset{2}{\cancel{6}} \times 16}{\underset{27}{\cancel{81}}} = \frac{32}{27} = 1\frac{5}{27}^{m}.\ \textit{Ans.}$$

4. How many hektoliters in a bin 4^{m} long, 2^{m} wide, and 1^{m} high?

$2 \times 4 \times 1 = 8$. $8^{cbm} = 8000^{l}$. $8000^{l} = \frac{8000}{100} = 80^{hl}$. *Ans.*

5. How high must a box be to hold 30^{l}, if it is 50^{cm} long and 20^{cm} wide?

$50 \times 20 = 1000^{qcm}$, area of base. $30^{l} = 30000^{ccm}$. $\frac{30000}{1000} = 30^{cm}$. *Ans.*

Ex. 171. (*Oral.*) Page 326.

1. How many grams in a kilogram? dekagram? hektogram?

1000; 10; 100. *Ans.*

2. What part of a gram is a centigram? decigram? milligram?

0.01; 0.1; 0.001. *Ans.*

3. In a ton, how many kilograms? grams? 1000; 1,000,000. *Ans.*

4. A hektoliter of water weighs how many kilograms? what part of a ton? 100; 0.1. *Ans.*

5. What is the weight in grams of 5^{ccm} of water? 5^{g}. *Ans.*

6. Change $12{,}260^{mg}$ into grams? 12.26^{g}. *Ans.*

7. Give the weight in kilograms of 0.275^{cbm} of water. 275^{kg}. *Ans.*

8. Change 0.546^{kg} to grams; to milligrams. 546^{g}; $546{,}000^{mg}$. *Ans.*

9. Change 0.563 of a ton to kilograms. 563^{kg}. *Ans.*

Ex. 172. Page 326.

1. What is the weight of water required to fill a vat 98^{cm} long, 71^{cm} wide, and 38^{cm} deep?

Contents $= (98 \times 71 \times 38)^{ccm} = 264404^{g} = 264.404^{kg}$. *Ans.*

2. A mass of 21.7^{g} is divided into 70 pills. What is the weight of each pill?

$21.7^{g} = 21700^{mg}$. $\frac{21700^{mg}}{70} = 310^{mg}$. *Ans.*

3. At 2 cts. a kilogram, what will 2.25 tons of hay cost?

$2.25^{t} = 2250^{kg}$. $2250 \times \$0.02 = \$45$. *Ans.*

4. At \$6 a ton for coal, what will it cost to heat a building 30 days, if it takes 400^{kg} of coal a day?

$30 \times 400^{kg} = 12000^{kg} = 12^{t}$. $12 \times \$6 = \$72$. *Ans.*

Ex. 173. Page 327.

1. A bar of iron 50^{cm} long, 4^{cm} wide, 1^{cm} thick has a specific gravity of 7.8. Find its weight in kilograms.

Contents $= (50 \times 4 \times 1)^{ccm} = 200^{ccm}$.
$7.8 \times 200^{g} = 1560^{g} = 1.56^{kg}$. *Ans.*

2. A piece of iron weighing 117^{kg} is made into a bar 6^{cm} wide and 2^{cm} thick. What is its length, if the specific gravity of the iron is 7.8?

End $= (6 \times 2)^{qcm} = 12^{qcm}$.
Weight of $1^{cm} = 7.8 \times 12^{g} = 93.6^{g}$.
$117^{kg} = 117000^{g}$.

$$\frac{117000^{g}}{93.6^{g}} = 1250 = \text{length in centimeters} = 12.5^{m}. \textit{ Ans.}$$

3. A cubical vessel, 40^{cm} on an edge, is full of water. If 14^{l} are drawn off, and replaced by a liquid of which the specific gravity is $\frac{7}{8}$ of that of water, what is the weight of the mixture?

Contents $= (40 \times 40 \times 40)^{ccm} = 64000^{ccm}$, and weighs 64000^{g}.
$14^{l} = 14000^{ccm}$, and weighs 14000^{g}.
$64000^{ccm} - 14000^{ccm} = 50000^{ccm}$, and weighs 50000^{g}.
$\frac{7}{8}$ of $14000^{g} = 12250^{g}$.
$50000^{g} + 12250^{g} = 62250^{g} = 62.25^{kg}$. *Ans.*

4. What will be the weight in air, in water, and in olive oil, of which the specific gravity is 0.915, of a cube of iron 6^{cm} on an edge, if the specific gravity of the iron is 7.8?

Contents $= (6 \times 6 \times 6)^{ccm} = 216^{ccm}$.
Weight of iron in air $= 7.8$ of $216^{g} = 1684.8^{g}$. *Ans.*
Weight of iron in water $= 1684.8^{g} - 216^{g} = 1468.8^{g}$. *Ans.*
Weight of iron in oil $= 1684.8^{g} - (0.915 \times 216^{g}) = 1684.8^{g} - 197.64^{g}$
$= 1487.16^{g}$. *Ans.*

5. What is the specific gravity of a substance of which 7.3^{ccm} weighs 31.5^{g}?

7.3^{ccm} water weighs 7.3^{g}. Specific gravity $= \frac{31.5}{7.3} = 4.315$. *Ans.*

6. A block of granite 60^{cm} long, 50^{cm} wide, 15^{cm} thick weighs 130.5^{kg}. Find its specific gravity.

Volume $= (60 \times 50 \times 15)^{ccm} = 45000^{ccm}$.
45000^{ccm} water weighs 45^{kg}. Specific gravity $= \frac{130.5}{45} = 2.9$. *Ans.*

7. What is the weight of a load of 250 paving stones, 15^{cm} square and 8^{cm} thick, if the specific gravity of the stone is 2.90?

Volume of each stone $= (15 \times 15 \times 8)^{ccm} = 1800^{ccm}$.
$250 \times 1800^{ccm} = 450000^{ccm}$.
450000^{ccm} water weighs $450000^{g} = 450^{kg}$.
$2.9 \times 450^{kg} = 1305^{kg}$. *Ans.*

8. A stick of timber 8^{m} long, 25^{cm} wide, and 23^{cm} thick is carried by 4 men. What weight does each carry, if the specific gravity of the timber is 0.53 of that of water?

Volume $= (800 \times 25 \times 23)^{ccm} = 460000^{ccm}$.
460000^{ccm} water weighs $460000^{g} = 460^{kg}$.
$0.53 \times 460^{kg} = 243.8^{kg}$.
$\frac{243.8^{kg}}{4} = 60.95^{kg}$. *Ans.*

9. Allowing that water in freezing is increased by $\frac{1}{11}$ of its volume, find the volume and the weight of a block of ice 80^{cm} long, 50^{cm} wide, 20^{cm} thick, and find how much water it will give on melting.

Volume of ice $= (80 \times 50 \times 20)^{\text{ccm}} = 80000^{\text{ccm}} = 0.08^{\text{cbm}}$. *Ans.*
Volume of ice $= \frac{16}{15}$ volume of water.
$\frac{15}{16}$ of $80000^{\text{ccm}} = 75000^{\text{ccm}} = 75$ volume of water. *Ans.*
75^{l} water weighs 75^{kg}. *Ans.*

10. A hall has a capacity of 450^{cbm}. Compute the weight of oxygen in the air that fills the hall, knowing that air contains 23% of its weight of oxygen, and weighs $\frac{1}{773}$ as much as water.

0.23 of $450^{\text{cbm}} = 103.5^{\text{cbm}}$ oxygen.
103.5^{cbm} water weighs 103500^{kg}.
$\frac{103500^{\text{kg}}}{773} = 133.894^{\text{kg}}$. *Ans.*

11. A bottle empty weighs 650^{g}; full of oil, it weighs 1075^{g}. What part of a liter will the bottle hold, if the specific gravity of the oil is 0.905?

$1075^{\text{g}} - 650^{\text{g}} = 425^{\text{g}}$.
Volume of water which weighs $425^{\text{g}} = 425^{\text{ccm}}$.

$$\text{Volume oil, specific gravity } 0.905 = \frac{1000 \times 425^{\text{ccm}}}{905} = 470^{\text{ccm}} \text{ nearly.}$$

$$470^{\text{ccm}} = \frac{470^{\text{l}}}{1000} = 0.47^{\text{l}}. \text{ } \textit{Ans.}$$

12. A vessel full of water weighs 9.68^{kg}, and, full of oil, of which the specific gravity is 0.91, weighs 9.266^{kg}. Find its capacity, and its weight when empty.

$9.68^{\text{kg}} - 9.266^{\text{kg}} - 0.414^{\text{kg}} = 414^{\text{g}}$.

$$\begin{array}{lrr} \text{Weight of } 1^{\text{l}} \text{ water} & = & 1000^{\text{g}} \\ \text{Weight of } 1^{\text{l}} \text{ oil} & = & \underline{910^{\text{g}}} \\ \text{Difference} & = & 90^{\text{g}} \end{array}$$

$\frac{414}{90} = 4.6$. Volume $= 4.6^{\text{l}}$. *Ans.*
4.6^{l} water weighs $4600^{\text{g}} = 4.6^{\text{kg}}$.

$9.68^{\text{kg}} =$ weight of vessel and water.
$\underline{4.6}^{\text{ kg}} =$ water.
$5.08^{\text{kg}} =$ weight vessel. *Ans.*

13. In a decimeter cube full of water is placed a chain of iron, of which the specific gravity is 7.8. When the chain is removed, the height of the water is just 5^{cm}. Find the volume and weight of the chain.

$1^{cdm} = 1000^{ccm}$. Base $= 100^{qcm}$.
Volume chain $= (100 \times 5)^{ccm} = 500^{ccm}$. *Ans.*
500^{ccm} water weighs 500^{g}.
Weight chain $= 7.8 \times 500^{g} = 3900^{g} = 3.9^{kg}$. *Ans.*

14. If a body weighs 3.71^{kg} in air, and 2.38^{kg} in water, what is its specific gravity?

$3.71^{kg} - 2.38^{kg} = 1.33^{kg}$ = weight of water displaced.
$\frac{3.71}{1.33} = 2.789$ = specific gravity. *Ans.*

15. From 106.25^{g} of rhubarb are made 125 powders. What is the volume of water of which the weight is equal to the weight of a powder?

$\frac{106.25^{g}}{125} = 0.85^{g}$. 0.85^{g} water $= 0.85^{ccm}$. *Ans.*

Ex. 174. Page 329.

1. A well is 18.2^{m} deep and the wheel is 1.4^{m} round. How many turns of the wheel will be required to raise the bucket?

$18.2^{m} \div 1.4^{m} = 13$. *Ans.*

2. Find the number of liters in a vat 2^{m} by 75^{cm} by 50^{cm}.

$2^{m} = 200^{cm}$.
$200 \times 75 \times 50 = 750000^{ccm}$
$= 750^{l}$. *Ans.*

3. Into how many pills of 325^{mg} each can a mass of 23.4^{g} be made?

$23.4^{g} = 23400^{mg}$.
$23400 \div 325 = 72$. *Ans.*

4. How many liters will a box hold which is 75^{cm} long, 15^{cm} wide, and 12^{cm} deep?

$75 \times 15 \times 12 = 13500^{ccm} = 13\frac{1}{2}^{l}$. *Ans.*

5. Add 3.473^{m}, 50^{cm}, 83^{mm}, 4.5^{m}, and 16^{cm}.

$3.473^{m} = 3.473^{m}$
$50^{cm} = 0.500$
$83^{mm} = 0.083$
$4.5^{m} = 4.500$
$16^{cm} = 0.160$
8.716^{m} *Ans.*

6. There are 4 measuring lines: the first is 7.5^{m}, the second is 3^{m} 75^{cm}, the third is 4^{m} 80^{cm}, and the fourth is $8^{m}\,6^{cm}$. Express in meters the total length of the four lines.

$$\begin{array}{ll}
7.5^{m} & = 7.50^{m} \\
3^{m}\,75^{cm} & = 3.75 \\
4^{m}\,80^{cm} & = 4.80 \\
8^{m}\,6^{cm} & = \underline{8.06} \\
 & \quad 24.11^{m}\ \textit{Ans.}
\end{array}$$

7. On the same railroad are four stations, between which the consecutive distances are as follows: $7^{km}\,249^{m}$, $3^{km}\,200^{m}$, and 5.007^{km}. Find in kilometers the distance between the first and fourth stations.

$$\begin{array}{ll}
7^{km}\,249^{m} & = 7.249^{km} \\
3^{km}\,200^{m} & = 3.200 \\
5.007^{km} & = \underline{5.007} \\
 & \quad 15.456^{km}\ \textit{Ans.}
\end{array}$$

8. A goldsmith has sold jewels of the following weights respectively: $27^{g}\,9^{mg}$, $30^{g}\,70^{cg}$, $7^{g}\,4^{cg}$, and $19^{g}\,34^{cg}\,7^{mg}$. Find the total weight in grams.

$$\begin{array}{ll}
27^{g}\,9^{mg} & = 27.009^{g} \\
30^{g}\,70^{cg} & = 30.700 \\
7^{g}\,\ 4^{cg} & = \ \ 7.040 \\
19^{g}\,34^{cg}\,7^{mg} & = \underline{19.347} \\
 & \quad 84.096^{g}\ \textit{Ans.}
\end{array}$$

9. From $17^{km}\,6^{m}$ take $243^{m}\,691^{mm}$.

$$\begin{array}{ll}
17^{km}\,6^{m} & = 17.006000^{km} \\
243^{m}\,691^{mm} & = \underline{\ \ 0.243691^{km}} \\
 & \quad 16.762309^{km}\ \textit{Ans.}
\end{array}$$

10. From a farm containing $340^{ha}\,7^{a}$ there are sold $119^{ha}\,29.03^{a}$; how many hektars are left?

$$\begin{array}{ll}
340^{ha}\,7^{a} & = 340.0700^{ha} \\
119^{ha}\,29.03^{a} & = \underline{119.2903} \\
 & \quad 220.7797^{ha}\ \textit{Ans.}
\end{array}$$

11. A liter of mercury weighs $13^{kg}\,598^{g}$. Find the weight in kilograms of 3.69^{l}.

$$\begin{array}{rr}
13^{kg}\,598^{g} = & 13.598^{kg} \\
 & \underline{3.69} \\
 & 122382 \\
 & 81588\ \ \\
 & \underline{40794\ \ \ \ } \\
 & 50.17662^{kg}\ \textit{Ans.}
\end{array}$$

12. If 16.94^{l} of olive oil weigh $15^{kg}\,500^{g}$, find the weight of one liter.

$$\begin{array}{r}
0.915 \\
1694\overline{)15500} \\
\underline{15246} \\
2540 \\
\underline{1694} \\
8460 \\
\underline{8470}
\end{array}$$

0.915^{kg}. *Ans.*

13. Into how many lots of 3.75^{a} may $8^{ha}\,40^{a}$ be divided?

$$\begin{array}{r}
224 \\
375\overline{)84000} \\
\underline{750} \\
900 \\
\underline{750} \\
1500 \\
\underline{1500}
\end{array}$$

224. *Ans.*

14. If 122.6^g of chlorate of potassa yield 48^g of oxygen, what weight of oxygen may be obtained from 1^{kg} of the chlorate?

$$1^{kg} = 1000^g.$$

Therefore,

$$\frac{1000 \times 48}{122.6} = 391.5^g. \textit{ Ans.}$$

15. A field of wheat containing $8\frac{1}{2}^{ha}$ furnished 600 sheaves per hektar; 2 sheaves of wheat furnished a bundle of straw weighing 5^{kg}. What will the whole straw bring, at $15 a ton?

8.5
600
2)5100 no. of sheaves.
2550 no. of bundles.
5
1000)12750 weight in kilograms.
12.75 weight in tons.
15
191.25 $191.25. *Ans.*

16. A farmer shears 620 sheep and 180 lambs; the sheep give on an average 4^{kg} of wool each, and the lambs $\frac{1}{4}$ of a kilogram each. The wool is sold for 50 cts. a kilogram. How much money does the farmer receive?

$620 \times 4^{kg} = 2480^{kg}$
$180 \times \frac{1}{4}^{kg} = 45$
2525^{kg}
0.50
1262.50

$1262.50. *Ans.*

17. A vessel full of water weighs 5.25^{kg}; the weight of the vessel when empty is 250^g. How many liters will the vessel hold?

5250^g
250
5000^g weight of water.

As one cubic centimeter weighs 1^g, the vessel contains

$5000^{ccm} = 5^l$. *Ans.*

18. Wheat weighs 80^{kg} a hektoliter. A field of 4.6^{ha} has produced 9.2 t. of wheat. If a sheaf of the wheat on the average gives 4^l of grain, find the average number of sheaves produced per hektar.

$9.2^t = 9200^{kg}.$
$\frac{9200}{80} = 115^{hl}$ produced $= 11500^l.$
$\frac{11500}{4} = 2875$, number of sheaves in all.
$\frac{2875}{4.6} = 625$, number of sheaves to the hectar. *Ans.*

19. A piece of zinc weighs in the air 343^g, and in water 293^g only. What is its volume?

343^g
293
50^g weight of water displaced. 50^g of water $= 50^{ccm}$. *Ans.*

20. A piece of zinc weighs in the air 343^g, and in water 293^g. What is its specific gravity?

$$\begin{array}{l} 343^g \\ \underline{293} \\ \ \ 50^g \text{ weight of water displaced.} \end{array}$$

Specific gravity $= 343 \div 50 = 6.86$. *Ans.*

21. A jug empty weighs 1.02^{kg}; full of water it weighs 3.8^{kg}. Find the capacity of the jug in liters.

$$\begin{array}{l} 3.80^{kg} \\ \underline{1.02^{kg}} \\ 2.78^{kg} \text{ weight of water.} \end{array}$$

Volume of water weighing $2.78^{kg} = 2.78^l$. *Ans.*

22. The price of 8 casks of olive oil, containing each 9.05^{hl}, is \$1072. What will be the price of 20^l?

$8 \times 9.05^{hl} = 72.40^{hl} = 7240^l$.

$$\frac{\cancel{20}}{\underset{\underset{181}{\cancel{362}}}{\cancel{7240}}} \text{ of } \$\overset{536}{\cancel{1072}} = \$2.96. \textit{ Ans.}$$

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